IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XVIII JULY 1939

JOHNPULLE (A. L.). **Chilli leaf-curl experiments. I. Preliminary infection tests.**—*Trop. Agriculturist*, xcii, 1, pp. 28–30, 2 pl., 1939.

Experimental evidence is adduced showing that the leaf curl of chilli as described by Park and Fernando [*R.A.M.*, xviii, p. 273] is caused by an undetermined species of thrips.

MILLER (L. I.). **Control of leafspot of Peanut with copper and sulphur fungicides.**—*Plant Dis. Reptr*, xxiii, 1, pp. 5–6, 1939. [Mimeographed.]

Good control of leaf spot of groundnuts (*Cercospora*) [*arachidicola* and *C. personata*: *R.A.M.*, xviii, p. 236] was obtained on 45 trial plots on sandy loam soil at Holland, Virginia, in 1938 by the following treatments: three applications of either Bordeaux mixture 8–12–100, lime-sulphur 2 in 100, with or without catalytic sulphur 4 in 100, or four proprietary sulphur dusts (98 to 100 per cent. through 325 mesh); two of Bordeaux followed by one of wettable sulphur (6·5 in 100); and one of Bordeaux followed by two of wettable sulphur. Severe foliar burning, however, was caused by lime-sulphur. The average increase of yield in field tests in six counties involving 30 plots of ¼ to 1¼ acres in extent dusted with sulphur as compared with the corresponding controls was 23·5 per cent.

ROLDAN (E. F.) & QUERIJERO (A. F.). **Black spot of Peanut.**—*Philipp. Agric.*, xxvii, 8, pp. 669–682, 6 figs., 1939.

The most prevalent and destructive disease of groundnuts in the Philippine Islands is black spot (*Cercospora personata*) [see preceding abstract]. The disease, which is always present at Los Baños, causes early death of the plants as a result of repeated defoliation. All attempts to isolate the fungus, using tissue and single-spore methods and employing a variety of media, failed to give any growth. Field studies showed that the organism persists in the soil from one season to the next as stromata in the dead refuse of diseased groundnuts, which may be covered with a protective layer of soil. The stromata produce fresh conidia as conditions become more favourable, and these conidia cause primary infection. Observations on plants grown from seeds from diseased groundnuts showed that *C. personata* is not seed-borne. Evidence is adduced that infection in the field is due to spores carried by the wind from the soil or from leaves of diseased plants. Of eight

varieties tested by being planted in infected fields none showed less than about 80 per cent. infection. The best hope of control lies in the development of resistant strains.

MACKIE (J. R.). **Annual Report on the Agricultural Department, Nigeria, 1937.**—38 pp., 1939.

Groundnut rosette [*R.A.M.*, xvii, p. 725] has tended to become more prevalent in recent years in the Kano Province of Nigeria. Incidence varies from year to year, but when heavy causes a considerable reduction of yield. The results obtained in the first year of a series of experiments designed to ascertain whether the disease can be checked by cultural methods indicated that weeding after the plants had become well established was of small advantage, for the disease spread in the weeded, and decreased in the unweeded plots, though the yield of the former was increased. Diseased plants in the weeded plots tended to outgrow the disease when the rainfall was good, whereas those in the unweeded plots remained stunted longer, but the infection did not spread.

PASSECKER (F.). **Meine Erfahrungen mit der Kultur des Shiitake.** [My experiences with the culture of Shiitake.]—*Z. Pilzk.*, N.S., xvii, 3–4, pp. 100–101, 1 pl., 1938.

In attempts to culture *Cortinellus shiitake* [*R.A.M.*, xv, p. 72] the fungus was grown on wood shavings from spores received from Japan and inoculum placed in holes drilled in blocks of red beech wood, stored in a rather damp cellar. The first fructifications appeared over two years later; the caps measured up to 7 cm. in diameter and were almost white. It is pointed out that under Austrian conditions cultures would suffer from lack of moisture in the field and that, therefore, cellars and similar rooms offer more promising surroundings.

WATANABE (T.). **Studies on the fire-blight disease of Udo Salad plant.**—*Ann. phytopath. Soc. Japan*, viii, 4, pp. 271–297, 13 figs., 1939. [Japanese, with English summary.]

Aralia cordata, the udo salad plant of Japan, becomes affected in late spring by a disease producing on the stem ellipsoidal or spindle-shaped, often confluent, brown spots measuring 3 to 11 by 1 to 2 mm., which later show a greyish-brown centre and a violet-brown border. Reddish-violet spots develop on the leaf blade, midrib, and petiole, and the leaves and flowers wither and dry up. The spherical or subspherical, dark brown pycnidia are mostly formed on the upper surface of the spot and measure 37·5 to 150 μ in diameter (75 to 300 μ in culture); they have a round ostiole, which perforates the epidermis, measuring 10 to 20 μ in diameter. The hyaline pycnospores are ellipsoidal or tapering at one extremity and measure 3·75 to 6·25 by 2·5 to 3·75 μ. Inoculation experiments on wounded leaves and stems of *A. cordata* with pycnospores grown in Richards's agar gave positive results, the incubation period for the disease being about 7 to 10 days. The fungus is named *Phoma araliae* Cooke & Massee var. *microspora* Watanabe, n.var. [with a Latin diagnosis].

VIDAL (J. L.). **À propos des traitements de la chlorose calcaire.** [On the subject of treatments against lime-induced chlorosis.]—*Progr. agric. vitic.*, cx, 51, pp. 518–520, 1938.

The author states that in his view a maximum of 12 l. of the 30 per cent. iron sulphate and 6 per cent. citric acid solution should be amply sufficient to swab 1 hect. of pruned vine stocks in the winter against lime-induced chlorosis [*R.A.M.*, xvii, p. 792]. On this basis he calculates the cost of materials for treatment as fr. 19·20 per hect., and contrasts this outlay with an increase in yield resulting from a single application of the solution in 1935 of 17·15 and 17 hectol. wine per hect. in the two following years, respectively, i.e., a financial profit of fr. 5,100.

In a brief note on p. 520, J. Branas states that in practice at least 80 l. of the solution are required per hect., at a cost of fr. 123, compared with fr. 13 for materials for treatment with 35 per cent. iron sulphate alone. He questions whether the expense of the citric acid is justifiable.

HERSCHLER (A.). **Kupfer und Arsen in Weinbergsböden und Reben.** [Copper and arsenic in vineyard soils and Vines.]—*Wein u. Rebe*, xxi, 1–2, pp. 1–17, 1939. [Italian and French summaries.]

Analyses of the clay-slate soils of the Moselle vineyards and of the wood and foliage of the Riesling vines cultivated therein lent no support to the view that the infinitesimal quantities of copper and arsenic accumulating in the uppermost layer of 25 cm. from repeated treatments against disease (e.g., *Peronospora* [*Plasmopara viticola*: *R.A.M.*, xviii, p. 232]) may be responsible for the obscure physiological disturbances observed locally for several years past. No deleterious effects on the vines from this source are anticipated.

SCHERZ (W.). **Zur Immunitätszüchtung gegen Plasmopara viticola.** [On breeding for immunity from *Plasmopara viticola*.]—*Züchter*, x, 9–11, pp. 299–312, 4 figs., 2 graphs, 1938.

After referring to the history of breeding vine varieties resistant to *Plasmopara viticola* [*R.A.M.*, xviii, p. 727], the author describes the breeding methods adopted at Müncheberg, Mark Brandenburg, Germany. Of first importance is the so-called '*Plasmopara* analysis', in which the F_1 generation hybrids between E (= European vine: *Vitis vinifera*) and A (American vines) or their reciprocals, and their back-crosses to E are sown in pots, and when the second leaf is developed artificially infected under optimal conditions in a special glasshouse. According to the degree of resistance shown by the hybrids, they are classified in five groups and the resistant ones (which usually amount to about 20 per cent.) are then grown in large-scale plantings. From these resistant individuals are again selected after artificial infection and planted in the field, where they are kept under observation for several years in regard to their resistance to other parasites, winter-hardiness, yield capacity, and quality. The most satisfactory in all these respects are increased to three stocks each, and the seedling population raised from them again submitted to '*Plasmopara* analysis' in order to find individuals of more or less homozygotic resistance. Such stocks, as well as F_1 forms exhibiting similar behaviour, are then back-crossed to the best German *V. vinifera* varieties.

The F_2 population of the hybrid Riparia × Gamay 595 Oberlin selected in this way showed complete resistance even in the years of optimal conditions for the development of the parasite, and it maintained this resistance to all populations of the fungus tested in special glasshouses at Müncheberg as well as under natural conditions in Italy, Rumania, and Turkey, a result indicating that *P. viticola* does not incline to form specialized races. This F_2 population, of which 35,000 stocks are now present at Müncheberg, exhibits great variation in the shape of the grapes and leaves, and in yielding capacity; only 18·2 per cent. were free from the typical 'grassy' taste of the American Riparia vines, a clear correlation existing between the grassy taste and the American habit. The *Plasmopara* analysis of F_1 and F_2 of E × A showed that only a few individuals among them are suitable for back-crossing.

Attempts to achieve immunity by interbreeding *V. vinifera* vines failed until it was discovered that only certain European varieties were suitable, and 300 entirely resistant *V. vinifera* seedlings were obtained, indicating that *V. vinifera* also has a gene for immunity.

BRANAS (J.). **Chronique. Choix des greffons et court-noué.** [Current notes. Choice of grafts and court-noué.]—*Progr. agric. vitic.*, cxi, 1, pp. 3–8, 3 figs., 1939.

The author points out that court-noué disease of the vine [*R.A.M.*, xviii, p. 294] is liable to be spread by the unwitting use on the part of growers of grafts which themselves show slight symptoms of the disease, e.g., fasciation, abnormal forking, or double nodes. In some cases it may be advisable for growers to obtain grafts from localities in which the disease seldom, if ever, occurs, such as areas free from *Phylloxera* [*vastatrix*], certain sandy coastal districts, and localities where the vines are very old and every year are subjected to flooding.

VOELKEL (H.) & KLEMM (M.). **Die wichtigsten Krankheiten und Schädigungen an Kulturpflanzen im Jahre 1938. (Beobachtungs- und Meldedienst der Biologischen Reichsanstalt.)** [The most important diseases and injuries of cultivated plants in the year 1938. (Observation and warning service of the Reich Biological Institute).]—*Beil. NachrBl. dtsch. PflSchDienst*, xix, 2, 31 pp., 4 graphs, 71 maps, 1939.

This fully detailed survey of the incidence and geographical distribution of the diseases and other injuries affecting cultivated plants in Germany in 1938 has been prepared on similar lines to those of previous years [*R.A.M.*, xvii, p. 375].

BAUDYŠ (E.). **Zpráva o škodlivých činitelích v hospodářském roce 1937–1938 v zemi Moravskoslezské.** [Report on pests and diseases during the agricultural year 1937–1938 in the Moravian-Silesian district.]—*Ochr. Rost.*, xv, 2, pp. 12–19, 1 fig., 1939. [German summary.]

This report records the diseases of economic crops occurring in 1937–8 in the Moravian-Silesian district of Czechoslovakia.

VIELWERTH (V.). **Choroby a škodci kultúrnych rastlín zapadného a stredného Slovenska za hospodársky rok 1937–1938.** [Diseases and pests of cultivated plants in western and central Slovakia during the agricultural year 1937–1938.]—*Ochr. Rost.*, xv, 2, pp. 19–23, 1939. [German summary.]

This is a brief account of well-known diseases and pests of economic crops recorded in Slovakia during 1937–8.

FIALA (F.). **Zpráva o škodlivých činitel'och kultúrnych rastlín na východ. Slovensku a Podk. Rusi v hospodárskom r. 1937–1938.** [Report on diseases and pests of cultivated plants in eastern Slovakia and Carpathian Ruthenia in the agricultural year 1937–1938.]—*Ochr. Rost.*, xv, 2, pp. 23–26, 1939. [German summary.]

This is an account of pests and diseases of economic crops in the Czechoslovakian districts of eastern Slovakia and Carpathian Ruthenia during 1937–8.

UPPAL (B. N.). **Appendix K. Summary of the work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1936–37.**—*Rep. Dep. Agric. Bombay, 1936–7*, pp. 219–227, 1938. [Received April, 1939.]

This report [cf. *R.A.M.*, xvi, p. 588] contains, among others, the following items of interest. Effective control of betel vine [*Piper betle*] wilt [chiefly caused by *Phytophthora* sp.: ibid., xi, p. 283 *et passim*] followed spraying with Bordeaux mixture (2–2–50) at planting time (October–November), in May before the monsoon, and on three further occasions at intervals of one month between June and September. One application of sulphur (200 mesh) at the rate of 30 lb. per acre made in January gave control of betel vine powdery mildew [? *Oidium* sp.: ibid., xvi, p. 588] in newly planted gardens. In old gardens two applications are necessary, and should be made in November and January. Betel vine anthracnose [ibid., xiv, p. 718] has become very prevalent in recent years in the Deccan; yellowish, irregular spots develop on the leaves, from which a species of *Gloeosporium* was isolated [cf. ibid., xvii, p. 445]. Affected leaves turn yellow and fall. The disease was associated with root infestation by nematodes.

POLE EVANS (I. B.). **Pasture, crop and insect problems of the Union. Annual Report of the Division of Plant Industry for the year ended 31 August, 1938.**—*Fmg S. Afr.*, xiii, 153, pp. 519–538, 11 figs., 1938.

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xvii, p. 441]. Investigations on the factors conducive to waste in stored lemons showed that the stage of maturity at which the fruit is picked is more important in this connexion than the temperature maintained between a range of 40° to 55° F., the liability to decay increasing parallel with ripeness. For instance, fruit from an eastern Transvaal packing-house at a silver to yellow colour developed 33·9 per cent. wastage, the incidence of which among lemons from the same orchard gathered at the green to silver stage being only 6·8 per cent. Attention is drawn to the risks attendant on the indiscriminate

washing of citrus fruits, even with approved disinfectants, the value of which is largely counteracted by the detrimental effects of increased handling, additional opportunities of contamination, and weakening of the rind.

A careful inspection of 91,761 orchard and 3,700 nursery trees in the citrus canker [*Pseudomonas citri*] danger zone revealed no trace of infection, and the disease may now be definitely stated to be non-existent in South Africa [ibid., xvii, p. 848]. Out of 745,037 trees examined for the presence of scaly bark or psorosis [loc. cit.] in the western Transvaal and Cape Province, 1,363 (0·18 per cent.) showed symptoms of the disorder.

Wemmershoek apples stored in ordinary wrappers contracted severe scald at 31°; the incidence of the trouble was appreciably reduced by the use of oiled wrappers over a four-month period, with the disadvantage, however, of extensive pitting in 5 to 25 per cent. of the fruit.

An abnormal drop of young litchi [*Nephelium litchi*] fruits was associated with infection by a *Pestalozzia* responsible for a serious rot of the ripe fruit [ibid., xiv, p. 426], which therefore presumably originates during or soon after flowering.

The Co. 281 sugar-cane variety has proved highly resistant to streak.

Helminthosporium turcicum caused a mild form of leaf blight in maize and kaffir corn [sorghum; ibid., xv, pp. 201, 344, 746], the former also suffering from ear rots due to *Fusarium* spp.

A pink discoloration of groundnut shells was also attributed to a species of *F.* (? *F. angustum*, the agent of similar damage on a previous occasion), while an olive-green tinge developing simultaneously was induced by a fungus which failed to grow beyond the pycnidial stage. A buff-coloured growth round the kernels was identified as the mycelium of *Rhizoctonia*.

Polyporus lucidus [*Ganoderma lucidum*] was responsible for a 'falling-over' tendency in *Acacia karroo* trees in the Fountains valley near Pretoria. A characteristic blue-green *Penicillium* was isolated from the grey-black discoloured wood of imported aspen [*Populus tremula*] logs, which were thereby spoilt for the purpose of match and matchbox manufacture.

New diseases included *Colletotrichum* spp. on granadilla [*Passiflora edulis*], cucumber, and *Tripteris*, the first-named contracting stem rot and the other two leaf spots, *Cercospora richardiaecola* causing leaf spot of *Arum* [*Zantedeschia aethiopica*], and *Fusarium* rot of bananas.

THOROLD (C. A.). **Annual Report of the Plant Pathologist on Coffee research at Mount Elgon.**—*Rep. Dep. Agric. Kenya, 1937*, ii, pp. 35–41, 1939.

Observations on the effect of an artificial shade canopy of split bamboos constructed over two acres of established coffee in Kenya showed that it appreciably reduced the incidence of Elgon die-back [*R.A.M.*, xvii, p. 640], confirming the view that adequate shade effectively controls the disorder. Experimental evidence demonstrated that removal of all the leaves from a coffee tree, thus creating carbohydrate deficiency in parts of the tree, is followed by typical Elgon die-back, even in shaded trees. Observations made on a large number of *Coffea*

arabica trees indicated that differences in susceptibility depend upon the fact that Elgon die-back is associated with a particular, prodigal growth habit and with premature loss of leaves.

On p. 19 of this report S. Gillett states that in spraying tests conducted from 1934 to 1938, inclusive, coffee trees sprayed with 1 per cent. carbide-Bordeaux in March, with the same mixture in March and June, with ½ per cent. carbide-Bordeaux on the same dates, and with Burgundy mixture yielded, respectively, averages of 9·27, 9·77, 7·21, 9·99, and 9·05 cwt. of clean coffee per acre, as against only 4·11 cwt. for the unsprayed control.

In the botanical section (pp. 55–61), Thorold gives a report by F. W. Evans stating that sixteen samples of wheat rust [*Puccinia graminis*] from different parts of Kenya were tested and the form present determined in 15 of them: K1 was obtained from one locality, K2 from seven localities, and K4 from five, while a suspected new form, K5, was recorded on 58. F. (L. 1) from three. Other tests indicated that Kenya Governor, Einkorn [emmer], and Reliance are resistant to the new form, 112 and 58. F. (L. 1) susceptible, and Kenya Standard on the borderline.

Seed dusting of the Redwing variety of linseed before planting with three mercurial dusts, agrosan G, Rd 8521, and Rd 8522, gave increased yields over the controls, the improvement being statistically significant in the case of the two last-named, which also increased the percentage of germination by 20 to 30 per cent.

Plant pathology and physiology.—*Rep. Tex. agric. Exp. Sta., 1937*, pp. 95–121, 1938. [Received April, 1939.]

This report [cf. *R.A.M.*, xvii, p. 590] contains the following items of interest. J. J. Taubenhaus and G. M. Watkins succeeded in practically inhibiting the growth of *Phymatotrichum omnivorum* on cotton [ibid., xviii, p. 175] by mixing samples of Miller clay loam, Yahola very fine sand, and Houston black clay soils with 2·5 per cent. of crude petroleum by weight.

G. E. Altstatt reports that a very low percentage of over 10,000 seeds from wilt-infected tomato plants germinated when plated and none of them produced colonies of *Fusarium* [*bulbigenum* var.] *lycopersici* [ibid., xviii, p. 234]. The fungus was found to have retained its viability in most of the dead, dry, wilt-infected tomato plants stored in the open shed since 1933, 1935, and 1936.

P. A. Young, describing the results of field tests with 44 varieties of tomato, states that resistance to *F. bulbigenum* var. *lycopersici* [ibid., xviii, p. 237] combined with desirable commercial qualities was found to exist in Louisiana Pink, Louisiana Red, Blair Forcing, Marvel, Marglobe, Michigan State, Sureset Forcing, Rutgers, Kanora, Prairiana, Illinois Pride, and Long Calyx Forcing. In tests with Greater Baltimore tomatoes the application of chloropicrin to the soil gave 90 to 100 per cent. control of *F. bulbigenum* var. *lycopersici* in the plots covered with glue-coated paper, and 81 to 94 per cent. in those watered after treatment.

P. A. Young, G. E. Altstatt, and A. L. Harrison report that spotted wilt of tomato [ibid., xviii, p. 235], first reported from south-western Texas in 1935, has become more prevalent.

G. T. Boyd obtained satisfactory control of die-back of roses [chiefly due to a species of *Diplodia*: ibid., xvii, p. 683] in the field by pruning off the flower buds before they opened. The application of sprays or dusts was not essential, but appeared to reduce infection somewhat when plants were not pruned.

G. T. Boyd and E. W. Lyle state that approximately 92 per cent. control of black spot (*Diplocarpon rosae*) [ibid., xvii, p. 821] was obtained on the Luxembourg rose with a dust containing 300-mesh sulphur and cuprocide, and a spray composed of Bordeaux mixture, wettable sulphur, and kayso. The best results were obtained when the removal of flower buds before opening was practised in conjunction with treatment by the fungicides. J. J. Taubenhaus found that the spores of *D. rosae* from infected rose leaves collected at fortnightly intervals from January to May remained viable for six weeks, the green leaves yielding more viable spores than the yellow ones.

G. T. Boyd found that the best adherence of cuprocide sprays, as determined by the sodium diethyl dithiocarbamate method of colorimetric analysis, was obtained by the use of commercial lethane spreader, other valuable compounds being dry areskap [ibid., xvii, p. 122], aresklene [ibid., xviii, p. 446], SS-3, wettable sulphur, and corikal N powder. The effect of a given spreader on the distribution of copper sprays upon foliage, as determined by the leaf-print method, varied little with the different copper compounds; spreaders superior in adherence were not necessarily superior in distribution. Spreader SS-3, lethane, wettable sulphur, aresket 240, and aresklene increased the toxicity of cuprocide, whereas kayso and dry ortho definitely reduced it.

A. L. Burkett found that 2 per cent. ceresan used at rates of 1 to 8 gm. per l. of nutrient medium inhibited the growth of damping-off fungi (*Pythium* sp. and *Rhizoctonia* sp.) in pure culture. Cuprocide, copper 'KB', and zinc oxide AAZ [ibid., xvii, p. 365] gave satisfactory control of the growth of the organisms when used at the higher rates, the first two being more effective on *Pythium* than on *Rhizoctonia*.

J. J. Taubenhaus and A. L. Burkett obtained effective control of pre-emergence damping-off of bush beans [*Phaseolus vulgaris*], beets (fodder and sugar), carrots, cotton, eggplants, groundnuts, hollyhocks, peas, peppers [*Capsicum* spp.], radishes, sorghum, spinach, sweet peas, tomatoes, and cucurbits by seed treatment with cuprocide. In the control of sore shin and damping-off of cotton cuprocide was less effective than 2 per cent. ceresan.

W. N. Ezekiel demonstrated that *Pythium arrhenomanes* [ibid., xvii, p. 735 and below, p. 448], isolated from sorghum seedlings and used for greenhouse inoculations in April, killed varieties both resistant and susceptible to the root and crown rot disease in the field, whereas in inoculations in May and June it produced no definite symptoms on any of the plants.

Forty-eighth Annual Report for the fiscal year ended 30th June, 1938.—*Bull. Wash. St. agric. Exp. Sta.* 368, 103 pp., 1938. [Received April, 1939.]

The section of this report dealing with plant pathology (pp. 59–67) [*R.A.M.*, xvii, p. 504] contains the following items of interest, apart

from those already noticed from other sources. In work by C. S. Holton, F. D. Heald, and E. F. Gaines during 1937, at least one new race of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetens*] was identified, bringing the number of recognized races up to 12 for *T. caries* and 9 for *T. foetens* [ibid., xvii, p. 804]. The 'short smut' race of *T. caries* [ibid., xvii, p. 505], which has caused heavy losses in Klickitat County, Washington, southern Idaho, northern Utah, and the Gallatin Valley of Montana was found for the first time in the Panhandle of Idaho, bordering on the Palouse country of south-eastern Washington.

Evidence obtained with *T. caries* and *T. foetens* demonstrated that even with monosporidial lines, race differentiation on a basis of cultural characteristics is unreliable. It was also found that hybrids between races within the same species had spores morphologically similar to the parent species. The spores of interspecific hybrids were smooth in some instances and reticulate in others. In tests for pathogenicity made with five hybrids between T_9 and L_8, segregation of factors for spore wall characters was noted. Two new selections from the cross Oro × Turkey-Florence were highly resistant to all races of bunt except L_8. Thatcher was the most susceptible of the spring wheats tested, being infected by 18 out of 19 races used in the tests, while Hope was the most resistant. Thirty-one races of *Ustilago avenae* and *U. levis* [*U. kolleri*] were tentatively identified.

Tests by F. D. Heald and R. Wellman with different aqueous solutions for the control of *Penicillium expansum* [ibid., xvii, p. 794] on punctured apples showed that 0·1 per cent. potassium dichromate, either in aqueous solution or in 1 per cent. hydrochloric acid, inactivated the spores in one minute. When used to wash apples, 0·4 per cent. potassium dichromate dissolved in 1 per cent. hydrochloric acid gave commercial control of *P. expansum* when allowed to act for 35 seconds.

Tests by G. W. Fischer of 160 collections of grasses for susceptibility to head smut (*U. bullata*) [ibid., xvii, p. 825] indicated the existence of many well-defined physiologic races of the fungus, each with a restricted host range, and showed varietal differences in susceptibility among some grass species. Culture experiments with 17 collections of *U. bullata* showed that most of the pathogenically different collections are culturally different, while those which resemble one another pathogenically are also similar in cultural behaviour; the collections differed widely in type, rate, and colour of growth, and monosporidial cultures of opposite sex from the same chlamydospore often differed materially in growth type. The evidence demonstrated that no two races or collections of *U. bullata* can necessarily be regarded as closely related merely because they parasitize species of the same genus of grasses. There was marked compatibility between some collections, while others failed to show even sporidial fusions.

In spore germination studies of *U. striaeformis* [loc. cit.] on grasses the fresh spores repeatedly showed 80 to 100 per cent. germination on nutrient agar. Inoculation tests demonstrated that *U. striaeformis* causes the seedling type of infection.

Isolations by L. Campbell from sugar beet black root [ibid., xvii, p. 506] yielded 31 different species or strains, inoculation tests with which resulted in typical symptoms only with a species of *Phoma*.

Good control of the pre-emergence stage only of the disease resulted from the addition of ceresan or formaldehyde dust to the fertilizer in the drill at planting. The evidence indicated that black root can be economically controlled by a crop rotation in which some cultivated crop other than beet is grown for the first year after a sod crop (clover, lucerne, grass, or mixtures). In one field of sugar beet the percentage of crown rot was much reduced and yield significantly increased by the use of 10 to 40 lb. of borax per acre, the value of the treatments increasing proportionately with the quantity of borax used.

Good control of bean [*Phaseolus vulgaris*] rust (*Uromyces appendiculatus*] [ibid., xvii, p. 427] in fields under overhead irrigation followed one to six applications of 1 in 100 lime-sulphur spray and 1 in 100 stopfire (the Saanichton KS-resin spray), the greater part of the protection afforded being given by the late applications.

Inoculation experiments by L. K. Jones showed that the viruses of geranium crinkle and mosaic [ibid., xvii, pp. 506, 684] are not transmitted by mechanical contact of injured plants, but are increased in the plantings through propagation from diseased plants.

Observations on trial plantings of Newburgh, Lloyd George, Taylor, Marcy, Indian Summer, and Latham raspberries showed that the last-named became affected with mosaic [ibid., xvii, p. 506] while the others remained healthy. In one locality the Newburgh variety has remained virus-free though grown beside affected Cuthbert raspberries for four years.

Department of Botany.—*Rep. Pa agric. Exp. Sta., 1937–8* (*Bull.* 367), pp. 31–35, 1 fig., 1938. [Received April, 1939.]

In this report [cf. *R.A.M.*, xvii, p. 378], E. L. Nixon states that three hybrids of the Richard Peters pear, which appears to be immune from fireblight [*Erwinia amylovora*: ibid., xvii, pp. 379, 401], were crossed with Bosc and fruited heavily. When artificially inoculated with *E. amylovora* in the blossoms and twigs one developed slight twig blight, while the others remained unaffected. Nearly 400 crosses of Richard Peters with standard varieties are now being grown.

W. S. Beach states that in 1937 tobacco wildfire [*Bacterium tabacum*: ibid., xvii, p. 379] was widespread and severe in Lancaster county. There was no significant difference in the degree of infection between plots given high nitrogen–low potash and others given low nitrogen–high potash fertilizer, or between plots with different degrees of soil acidity (P_H 5·1 to 6·2). Adjacent rows of maize reduced the severity of wildfire by about a half. Infection was experimentally transferred to healthy tobacco by means of flea-beetles [*Epitrix parvula*: ibid., xv, p. 613].

J. W. Sinden found that the addition of soil to mushroom [*Psalliota* spp.] compost increased yields. The best crop was obtained when 900 lb. soil were added to each ton of manure. Some slight advantage appeared to be given by adding the soil at the end of the composting.

Fiftieth Annual Report of the Rhode Island State College Agricultural Experiment Station.—44 pp., 1938. [Received April, 1939.]

The addition of oiled paper to packages of apples in Rhode Island to

control storage scald [*R.A.M.*, xvii, p. 691 and above, p. 438], which seriously affects several varieties, including Rhode Island Greening, has not proved entirely successful. The results of experimental pickings of Rhode Island Greening apples on 1st, 4th, 8th, 11th, 15th, and 23rd September 1936, packed with and without oiled paper, demonstrated that, while the use of the oiled paper reduced scald, by far the most important factor in controlling the condition was the date of picking, the number of apples free from scald increasing from 29 to 79 per cent. when harvesting was postponed from 1st to 23rd September.

In further investigations on the influence of sprays upon the activity of apple leaves [cf. ibid., xvii, p. 445], applications of kolofog (6 to 10 lb. per 100 gals.) did not lead to any reduction in assimilation.

When Marglobe tomato plants in the field were sprayed with various materials, the lowest percentage of dead leaves (death resulting from spray injury with or without early blight due to *Alternaria solani*) was given by Bordeaux mixture 12–4–50 (containing free copper); Bordeaux mixture (4–4–50), the same plus 1·5 per cent. volck nursery oil [ibid., xvi, p. 714], copper oxychloride, and Bordeaux mixture (4–12–50) showing increasing percentages of dead leaves. An application of 4 lb. hydrated lime in 50 gals. water produced no apparent injury until rain fell about a week after the spraying, whereupon all the plants were at once killed. Plants sprayed with Bordeaux mixture (4–4–50) at 8 p.m. made the greatest growth, followed (in order) by those sprayed at 8 a.m. and 2 p.m. Night spraying reduces spray injury while still adequately controlling disease.

Early blight (*A. solani*) was of great importance in destroying the foliage of field tomatoes in 1937. In several instances, leaf infection reached nearly 100 per cent., and on one occasion at least crop failure resulted. The destructiveness of the disease appears to be increasing, and no commercial variety shows any marked resistance. In field spraying and dusting tests red copper oxide (cuprocide 54) used as a spray (3½ lb. per 100 gals.) checked infection and gave the least visible residue. Cuprous oxide-lime dust (10–90) gave good control, while the vines sprayed with cuprocide or Bordeaux mixture (4–4–50) retained the green colour of their foliage until late in the season and had the largest amount of green fruit when the plants were cleared on 23rd September.

Club root of cabbage (*Plasmodiophora brassicae*) was completely controlled by application to the soil (in holes) of chloropicrin [ibid., xvi, p. 720], whereas the controls showed an average of 23 per cent. diseased plants.

Pure culture studies of *Botrytis elliptica* [ibid., xvi, p. 752], which caused a total loss of an estimated crop of 50,000 lily blossoms, indicated that spores are formed only under cool, moist conditions. The mycelium and sclerotia remained viable after several months' storage adjacent to the freezing unit of a refrigerator.

Laboratory tests on the toxicity of about 50 fungicides to the spores of *Sclerotinia fructicola* showed that copper fungicides were about equally toxic at 18° and 29° C. Bordeaux mixtures (4–4–50, 4–2–50, 4–0–50, and 2–4–50) with hydrated lime all gave over 97 per cent. inhibition of germination, and the 4–2–50 mixture over 99 per cent. Hydrated lime and water (4–50) averaged 15·5 per cent. inhibition.

Certain proprietary brands of copper fungicides, especially the 'dry Bordeaux mixtures', with one exception, permitted over 50 per cent. germination. Cuprous oxide and copper oxychloride, as a spray, or combined with lime as a dust, gave over 96 per cent. inhibition. Some sulphur fungicides were as toxic at 18° as at 29°, but others were 47 per cent. more toxic at the higher temperature than at the lower. Liquid lime-sulphur (1 in 50) gave over 97 per cent. inhibition. Various proprietary substances, all labelled 'dry lime-sulphur', used at the rate of 4 lb. per 100 gals. of water allowed 3 to 52 per cent. germination. Some types of colloidal sulphur, used at a rate of 6 lb. per 100 gals., gave under 10 per cent. germination, but many others at rates of 8 to 16 lb. per 100 gals. allowed 50 to 95 per cent. It would appear to be urgently important that standards of toxicity should be formulated for fungicides.

Three applications (or enough to keep the trees covered) of Bordeaux mixture (4–4–50) made to the new growth of juniper trees and seedlings gave complete control of *Phomopsis* blight [? *P. juniperovora*: ibid., xvi, p. 299].

Silayan (H. S.). **Annual Report of the Director of Plant Industry, Commonwealth of the Philippines, for the fiscal year ending December 31, 1937.**—182 pp., 21 pl., 2 graphs, 1938. [Received March, 1939.]

The section of this report [cf. *R.A.M.*, xvi, p. 659] dealing with plant pathology (pp. 68–75) contains, *inter alia*, the following items of interest. During the period under review, maize in the Philippine Islands was affected by *Sclerospora philippinensis* [ibid., xv, p. 794], *Ophiobolus heterostrophus* [ibid., xvii, p. 432], and *Helminthosporium inconspicuum* [*H. turcicum*: ibid., xvii, p. 15 and above, p. 438], of which the first was the most destructive, causing stunting and sterility in 5 to 90 per cent. of the plants in some fields. Carrots were infected by *Macrosporium carotae* [ibid., xv, p. 632] and *Sclerotium rolfsii* [ibid., xi, pp. 298, 349]. No eggplant variety tested was completely immune from *Phomopsis* [*vexans*: ibid., xviii, p. 370], but Pampanga White was very highly resistant, as well as being very resistant to bacterial wilt [*Bacterium solanacearum*], though the fruits were extremely susceptible to *Phytophthora melongenae* [*P. parasitica*: ibid., v, p. 205; xvii, pp. 699, 796]. The Lemery and Iloilo Purple varieties were moderately resistant to combined attacks of all three diseases.

Selections of Irish potato from strains which effectively withstood late blight [*Phytophthora infestans*] in 1936 again proved highly resistant under field conditions and gave two or three times the yield of the susceptible Japanese white variety. Baguoi Selection No. 8 was classified as very highly resistant, while Baguoi Selections Nos. 1, 2, 3, 4, and 5 (sister tubers) were classified as resistant to slightly susceptible. In other field tests, Sutton's Command and Glasgow Favourite were quite resistant, and May Queen and Inverness Favourite very susceptible.

The Narcisa strawberry variety was very highly resistant to leaf spot [*Mycosphaerella fragariae*].

The results obtained in tests with abacá [*Musa textilis*] for varietal resistance to bunchy top [ibid., xviii, p. 256] indicated that it may be

possible to rehabilitate the industry by planting resistant varieties. The Putian variety averaged 96 per cent. resistance, as against 14 to 78 per cent. for other varieties tested. At present, about 10,000 healthy plants are available for planting purposes. In 1935, 1,000 healthy rootstocks of Putian were planted for trial purposes, and so far they have resisted attack.

Israilski (V. P.) & Chistoserdova (Mme G. V.). Серодиагностика некоторых флюоресцирующих фитопатогенных бактерий. [Serodiagnostics of some fluorescent phytopathogenic bacteria].—Микробиол. [*Microbiol.*], vii, 7, pp. 809–828, 3 figs., 1938. [English summary.] [Received May, 1939.]

Several strains of *Bacterium* [*Pseudomonas*] *citriputeale* [*R.A.M.*, xv, p. 575] were isolated from branches of lemon and tangerine trees affected by blast [ibid., xvii, p. 812] and studied in comparison with other strains of the same organism from various districts of U.S.S.R. and with other bacteria. Meat peptone agar plus malachite green (1 : 100,000) was found to be a very suitable culture medium because it arrested the growth of spore-bearing and saprophytic bacteria, but allowed the development of fluorescent pathogenic bacteria, almost all of which formed the same characteristic type of colony with a wavy margin and a slightly uneven surface. The majority of the strains of *P. citriputeale* liquified gelatine, peptonized and alkalized milk, and failed to form acids from sugars (excepting a few strains on glucose), while some strains were divergent in their biochemical properties and later proved to differ also in their serological properties and pathogenicity. The bacteriophage from *Bact. xanthochlorum* [ibid., xvi, p. 339] and that from *P. citriputeale* isolated from tangerine dissolved all bacteria belonging to the fluorescent group but no other. Sera of rabbits immunized against *P. citriputeale* agglutinated all strains of this bacterium and some of *Bact. tabacum*, while sera immunized against *Bact. mori* agglutinated most of the strains of *P. citriputeale* and some of *Bact. tabacum*. Strains of *P. citriputeale* aberrant in their biochemical properties were not agglutinated by sera of either *P. citriputeale* or *Bact. mori*. It is assumed from a certain inconsistency in the serological data that some of the fluorescent bacteria contain a mixture of antigens, of which some are specific and others non-specific for the given bacteria. Of the strains of *P. citriputeale* only those with the biochemical and serological properties typical for this bacterium proved pathogenic to the branches, leaves, and fruits of lemons, whereas the aberrant strains and also *Bact. mori*, *Bact. tabacum*, and *Bact. xanthochlorum* were not pathogenic.

Solacolu (T.), Constantinesco (M.), & Constantinesco (T.). **Action de la colchicine sur les tumeurs végétales provoquées par le Bacillus tumefaciens.** [The action of colchicin on plant tumours induced by *Bacillus tumefaciens*.]—*C.R. Soc. Biol., Paris*, cxxx, 11, pp. 1148–1150, 1939.

In experiments at the Faculty of Pharmacy, Bucharest, Rumania, the development of crown gall tumours (*Bacterium tumefaciens*) in *Pelargonium zonale* and *Ricinus communis* was arrested by application of a lanoline paste containing 0·50 to 0·75 per cent. colchicin [*R.A.M.*,

xvii, p. 661], the inhibitory action of which is stronger on young than on older outgrowths and increases parallel with the duration of the treatment. The mechanism of the arrested growth and necrosis of the tumours consists in the formation, in the subero-phellodermic layer, of a meristem separating the sound from the diseased tissues and so interrupting the biological continuity between the pathogen and its host.

Brown (Nellie A.). **Colchicine in the prevention, inhibition, and death of plant tumors.**—*Phytopathology*, xxix, 3, pp. 221–231, 2 figs., 1939.

Attempts were made to prevent the inception of crown gall (*Bacterium*) tumours, to inhibit growth already begun, and to kill mature excrescences in various hosts of the organism by different methods of treatment with colchicin [see preceding abstract]. The initial development of galls was prevented only in a few cases, i.e., 2 *Chrysanthemum frutescens* out of 15, 4 *Tagetes patula* out of 18, 1 tomato out of 14, and 2 beans (*Phaseolus vulgaris*) out of 7, by stem injections with 0·2 to 0·5 c.c. of a 2 per cent. solution, and in 3 *C. frutescens* and 2 beans out of a total of 84 plants treated by the insertion of a lip of the basal stem in a 0·06 to 2 per cent. colchicin solution for several hours before inoculation. Out of a total of 305 tumours on *C. frutescens*, *T. patula*, *Nicotiana glauca*, *Kalanchoë daigremontiana*, and *Bryophyllum pinnatum*, 239 were inhibited and eventually died as the result of a single brushing with colchicin (mostly at a strength of 2 per cent.); however, none of the 49 tomato galls included in this series succumbed to the treatment. The hosts were in no way adversely affected by the application of colchicin. Indoleacetic acid tumours similarly treated ceased to develop but were not destroyed.

Bennett (F. T.). **Fusarium disease of cereals.**—*J. Minist. Agric.*, xlv, 11, pp. 1115–1118, 3 figs., 1939.

This is a popular account of the diseases of cereals caused by species of *Fusarium* [*R.A.M.*, xv, p. 6] which were responsible for considerable losses in 1938 in England, where winter wheat is most frequently attacked while barley may also suffer severely (up to 75 per cent. loss in the seedling stage in one instance). The different symptoms are described and the following suggestions made for control. Expert advice should be sought where a crop shows signs of ill health; if there is no reason to the contrary stubble should be ploughed under deeply, using the skim coulter; seeds of doubtful origin and poor appearance should not be used and all should be treated with one of the mercurial dusts; and finally, good growing conditions should be provided with regard to surface drainage, tilth, firm bottom, and proper time of sowing.

Beilin (I. G.). Эпифитии ржавчин на Пшенице за последние годы на северном Кавказе и факторы, способствовавшие их возникновению и развитию. [Recent Wheat rust epidemics in North Caucasus and factors favouring their outbreak and development.] —*Bull. Acad. Sci. U.R.S.S., 1938*, Sér. biol., 5–6, pp. 995–1016, 1938. [English summary.] [Received April, 1939.]

Russian breeding work is stated to have been until recently mainly concerned with the development of hardy, prolific, and drought-resistant wheat varieties without much attention being paid to their

reactions to smut and rusts. Thus, the most popular Russian standard wheats, Caesium 0111, Erythrospermum 341, Durable, Ukrainka, Kooperatorka, and Hostianum 237, are all highly susceptible to *Tilletia tritici* [*T. caries*], *Puccinia triticina*, *P. graminis*, or *P. glumarum*, while several of the best oats are very susceptible to *P. coronifera* [*P. lolii*]. The climatic conditions of North Caucasus, with its 3,000,000 hect. of winter wheat land, permit the overwintering of the rusts, and the relatively high day temperatures in June and abundant rainfall and dew in May and June facilitate their rapid development. The use of susceptible varieties under these conditions and the absence of correct crop rotations led to severe rust epidemics in North Caucasus in the years 1932 to 1937, lowering the quality of the grain and reducing the yields in some years and districts to about half the normal.

MILAN (A.). **Sul 'carbone volante' del Grano in rapporto all' accestimento delle piante.** [On loose smut of Wheat in relation to tillering.] —*Nuovo G. bot. ital.*, N.S., xlvi, 1, pp. 149–157, 1939.

In continuation of his earlier investigations [*R.A.M.*, xvi, p. 239] the author found in large-scale experiments during 1935 to 1938 with seed of wheat varieties artificially infected with loose smut (*Ustilago tritici*) that thickness or thinness of sowing exercised virtually no effect on the percentage of plants that became infected, but very greatly affected the percentage of ears that became diseased. Any condition that increased tillering lowered the percentage of ears that became diseased. Thus, to cite a few examples, in infections made in 1935, the percentage of infected ears from Mentana wheat sown thinly was 85, while that of plants sown thickly was 95·4, the corresponding figures for Fam. 96 Todaro being 61·9 and 80·6. In the infections made in 1936, Mentana wheat sown thinly gave 71·4 per cent. infected ears; but when five and ten times as many grains were sown in the same area the percentages of infected ears were, respectively, 78 and 83·4. With the Rachael variety thin and thick sowings gave 68·8 and 77·5 per cent. infected ears respectively. In the third year, Rieti n. 11 Todaro sown thinly gave 60·5 per cent. infected ears, the latter figure rising to 80·5 per cent. when sowing was five times, and to 86 per cent. when it was ten times, as thick. In any variety the percentage of infected plants was invariably higher than that of infected ears. Tests in containers demonstrated that the percentage of plants infected was the same as the percentage of ears infected only when no tillering took place.

These experiments show that in experiments on the varietal resistance of wheat to *U. tritici* serious errors may occur if the ability of the plants to tiller is not taken into consideration.

MILAN (A.). **Sensibilità per la Ustilago tritici (Pers.) Jens. di alcuni ibridi normali di Frumento.** [The susceptibility to *Ustilago tritici* (Pers.) Jens. of some normal hybrids of Wheat.]—*Riv. Pat. veg.*, xxix, 1–2, pp. 71–84, 1939.

In four years' field experiments carried out in Italy on the susceptibility of wheat hybrids to *Ustilago tritici* the author made direct and reciprocal crosses between (*a*) two susceptible parents, (*b*) one susceptible and one resistant, (*c*) one resistant and one susceptible, and (*d*) two

resistant, and made floral inoculations at the time of crossing with the chlamydospores of the fungus collected in the locality where the tests were made.

Determinations [which are tabulated] of the percentage of affected plants and ears shown by the F_1 generation (normal hybrids) of the crosses and each of the parents demonstrated that of the parent varieties tested, Mentana, Gentile rosso mutico, Rieti 11 Todaro, Fam. 96 Todaro, Rachael, and Grano 28 ottobre are highly susceptible. Damiano Chiesa, Virgilio, and Carlotta inalletabile are moderately susceptible, and Federation × Khapli and Littorio highly resistant. The reaction of the F_1 progeny of direct and reciprocal crosses was the same. All the crosses of very susceptible with very resistant parents gave normal hybrids, whose resistance was practically complete, such resistance being a dominant character. Normal hybrids from two very susceptible or very resistant parents showed the same type of reaction as the parents. The percentage of infected plants was constantly much higher than the percentage of infected ears [see preceding abstract], and in experiments on the reaction of wheat hybrids to *U. tritici* the percentage of affected plants and not ears should be determined. There was no evidence of matroclinous or patroclinous inheritance.

Glynne (Mary D.). **III. Eyespot lodging of Wheat caused by Cercosporella herpotrichoides Fron.**—Reprinted from *Agric. Progr.*, xvi, 1, 5 pp., 1939.

Eyespot lodging of wheat (a name approved by the Plant Pathology Committee of the British Mycological Society) results from infection with *Cercosporella herpotrichoides* [*R.A.M.*, xv, p. 433; xviii, p. 98], though lodging due to other causes (e.g., non-parasitic factors, Hessian fly [*Mayetiola destructor*], *Fusarium culmorum*) seldom occurs in England, where the importance of the disease only began to be recognized in 1937, when it was prevalent in different localities. At Rothamsted in 1937–8 the fungus was found sporing freely on stubble left lying in the field after ploughing, suggesting that infected stubble is the main carrier of infection to the subsequent crop. After about the middle of April spores did not seem to occur on diseased lesions on plants in the field, and this scarcity of spores has made it very difficult in the past to diagnose the disease. When 80 per cent. or more of the culms were infected, lodging was severe; at lower percentages it was less severe or confined to individual culms. Both wheat and barley were most severely affected when sown in winter, spring sowings escaping serious infection. Oats appeared to be practically immune. In England, as in other countries, the disease is favoured by moist growing conditions and by repeated cropping. The effect of fertilizers rich in nitrogen in increasing the incidence of the disease was observed in the field at Rothamsted, where it was more marked in 1937 than in 1938.

Graham (V. E.) & Greenberg (L.). **The effect of salicylic aldehyde on the infection of Wheat by Pythium arrhenomanes Drechsler, and the destruction of the aldehyde by Actinomyces erythropolis and Penicillium sp.**—*Canad. J. Res.*, Sect. C., xvii, 2, pp. 52–56, 1 fig., 1939.

The results of pot experiments with wheat conducted in Saskatche-

wan, showed that the addition of salicylic aldehyde at the rate of 50 p.p.m. to soil before sterilization and subsequent inoculation with strain SH_2 of *Pythium arrhenomanes* [see above, p. 440], the fungus primarily associated with browning root rot of wheat, intensified the injury caused by the fungus [cf. ibid., xvii, p. 488]. The effect of salicylic aldehyde seemed to be on the plant rather than on the fungus, as it was shown that the organism could not grow on a medium containing 10 p.p.m. of the substance, an amount which was without effect on the wheat. Grown on a mineral salt-salicylic aldehyde medium, *Actinomyces erythropolis* and a species of *Penicillium* (probably *P. rivolli*), isolated from the soil of a healthy area of a partially infected field, were found to destroy salicylic aldehyde. It is suggested that when unfavourable soil conditions inhibit the growth of organisms that are capable of destroying salicylic aldehyde or other substances acting in a similar manner, such substances may accumulate in the soil and thus predispose wheat to attacks of *P. arrhenomanes*.

Ledingham (G. A.). **Studies on Polymyxa graminis, n.gen., n.sp., a Plasmodiophoraceous root parasite of Wheat.**—*Canad. J. Res.*, Sect. C., xvii, 2, pp. 38–51, 5 pl., 3 figs., 1939.

This is an expanded account of studies on the life-history of *Polymyxa graminis*, a preliminary note on which has already appeared [*R.A.M.*, xii, p. 358]. The fungus has since been found on wheat plants in the Vineland Horticultural Station and isolated from the soil at the Agricultural College Farm, Guelph, Ontario. The large, multinucleate zoosporangia of the fungus are stated to develop from uninucleate amoebae by progressive lobular outgrowths. The resting spore clusters are formed by segmentation of naked, multinucleate myxamoebae without the formation of a soral membrane. The smooth, yellow-brown, spherical or many-sided resting spores measure 5 to 7 μ in diameter. Zoosporangia and resting spores produce identical zoospores, 4 to 5 μ in diameter, each with one short and one long flagellum. The process of penetration has not been observed, but it is thought that the entire amoeba passes into the cell as described by Miss Curtis for *Synchytrium* [ibid., i, p. 80]. English and Latin diagnoses are given of the new genus and species.

Elliott (Charlotte) & Robert (Alice L.). **Tripsacum dactyloides, another native host of Aplanobacter stewarti.**—*Phytopathology*, xxix, 3, pp. 284–285, 1939.

Attention is drawn to the occurrence of bacterial wilt (*Aplanobacter stewarti*) on *Tripsacum dactyloides* of Texan origin growing at Arlington, Virginia, in proximity to a plot of infected susceptible maize [*R.A.M.*, xviii, p. 244]. No inoculations were made, but the *T. dactyloides* leaves bore numerous injuries inflicted by the flea-beetle, *Chaetocnema pulicaria*, in the course of feeding. The yellow bacteria isolated from the brown streaks, 1 to 3 in. by 1 to 3 mm., produced typical wilt symptoms on a susceptible line of maize. Repeated field and greenhouse inoculation experiments with *A. stewarti* on *T. dactyloides* and three other *T.* spp. gave exclusively negative results, and no natural infections have previously been observed. Probably, however, the small, inconspicuous

lesions produced by the pathogen on *T. dactyloides* are present every year.

DIACHUN (S.). **The effect of some soil factors on Penicillium injury of Corn seedlings.**—*Phytopathology*, xxix, 3, pp. 231–241, 1939.

In tests at the Kentucky Agricultural Experiment Station *Penicillium oxalicum* induced severe stunting of maize seedlings raised from kernels with damaged seed coats when the kernels were inoculated with a spore suspension or planted in soil contaminated with the fungus [*R.A.M.*, xiv, p. 355]. The extent of the injury on wounded and inoculated kernels was reduced by pressure into contact with very wet soil. *P.* sp. (K3), isolated from a diseased ear in the field, and *P. notatum* [ibid., xvii, p. 519; xviii, p. 173] afforded wounded kernels a degree of protection against soil infection by *P. oxalicum*, though no antagonism was apparent between the organisms in culture. The protective action of K3 and *P. notatum* was enhanced by heavily inoculating the grain with these species, and also by their introduction 24 hours before planting the seedlings in soil infested by *P. oxalicum*. The sooner after germination the injured kernels were inoculated with *P. oxalicum*, the greater was the damage inflicted. This fungus produced a toxic substance on Richards's solution and on autoclaved and living kernels. *P. notatum* and K3 neither formed toxins nor damaged wounded and inoculated kernels planted in sterile greenhouse soil.

BAKER (R. E. D.). **The control of scab and certain other diseases and pests of Grapefruit by fungicides and insecticides.**—*Trop. Agriculture, Trin.*, xvi, 2, pp. 31–34, 1939.

Notes are given on the chief diseases of grapefruit and their control, by spraying under the conditions prevailing in Trinidad. The different spraying programmes usually adopted are described, and the paper concludes with a description of the best known types of stationary and mobile spraying apparatus.

KLOTZ (L. J.) & FAWCETT (H. S.). **Isolation of Phytophthora spp.**—*Phytopathology*, xxix, 3, pp. 290–291, 1939.

The isolation of *Phytophthora citrophthora* and *P. parasitica* from citrus gummosis cankers, affected twigs, and diseased nursery stock [*R.A.M.*, xviii, pp. 103, 308] is apt to be complicated by extraneous contamination of the material, but pure cultures may readily be secured by the following method. The infected bark is thoroughly cleansed in running water, and the specimen then supported on hardware cloth [wire netting] at the top of a glass container with the diseased portion touching the water but not immersed. After three or more days in the running water, mycelium of *P.* spp. and other fungi will have grown out from the bark, and by the end of five days or a week the former will usually have produced sporangia. Freshly picked lemons in the silver or early tree-ripe stages are placed on the hardware cloth with the diseased specimen and zoospore formation induced by substituting water cooled to 15° C. for the tap water. These organs soon invade the lemon rind and typical brown rot ensues in four to seven days. The fruit is then removed and the decay allowed to proceed until complete permeation

by the *Phytophthora* hyphae is accomplished, but stopping before the intrusion of secondary *Penicillium* spp. The surface of the lemon is then flame-sterilized, the fruit cut open, and its seeds aseptically transferred to glucose potato agar or some other suitable medium, which has invariably yielded pure cultures of *P. citrophthora* and *P. parasitica* in the writers' cases of active gummosis.

Thomas (K. M.) & Marudarajan (D.). **Some aspects of the control of koleroga or mahali disease of the Areca Palm.**—*Madras agric. J.*, xxvi, 11, pp. 435–438, 1938.

The best control of koleroga disease [*Corticium koleroga*] of areca nut palms [*Areca catechu*: *R.A.M.*, viii, p. 258] in experiments in South Kanara in 1936 was given by two applications of 1 or 2 per cent. Bordeaux mixture, the addition of ½ gall. coco-nut oil or 2 lb. casein being helpful, especially in the case of the lower strength. Cuprous oxide was less effective. The total costs of the chemicals and adhesives required for the treatment of 500 trees with 50 gals. 2 per cent. Bordeaux mixture (1) plain, (2) with resin, (3) with oil, and (4) with casein were Rs. 2·3, 3·3, 2·4, and 2·7, respectively.

Bliss (D. E.). **The Penicillium disease of ornamental Palms.**—*Proc. fifth W. Shade Tree Conf., 1938*, pp. 20–27, [? 1938].

The author tentatively suggests that *Penicillium vermoeseni*, causing diseases of *Phoenix canariensis*, *Washingtonia filifera*, and *Cocos plumosa* [*R.A.M.*, xv, p. 91], is synonymous with *Penicillium roseum* [ibid., xiii, p. 481]. In unpublished notes filed at the Citrus Experiment Station, W. T. Horne (1913) and C. O. Smith (1917) attributed the disease of *W. filifera* to *P. roseum*; H. S. Fawcett (1924, 1930) isolated the same fungus from *Phoenix canariensis*; and E. L. Reeves (1926) demonstrated the pathogenicity of *Penicillium roseum* to *W. filifera* by inserting the fungus through wounds in the leaf bases of the palm and obtaining lesions in 5 out of 12 inoculations, two of which again yielded *P. roseum*. The disease is described as producing discoloured linear streaks on the leaves of *Phoenix canariensis*, the pinnae becoming yellowish brown and dying; blister-like pustules may form on the dead leaves. The disease seems to spread by contact from one leaf base to another, death of the palm occurring when the terminal bud is invaded. On *W. filifera* local necrotic areas form and enlarge rapidly on the young, tightly folded leaves in the crown of the palm, the infection spreading by contact from one folded leaf to the next one below it. Stunted and deformed leaves, retarded terminal growth, and great masses of rose-coloured spores between the layers of leaves are characteristic of the disease. Vigorous individuals of this species may recover. On *C. plumosa* the cankers formed on the trunks may remain very inconspicuous for several years. On date palms the disease is usually observed in association with the *Diplodia* disease. Generally speaking, the *Penicillium* disease occurs in California along a fairly narrow strip of coast from Mexico to the region of San Francisco Bay, where the ornamental plantings are more or less seriously affected, and in the south of the State. It seems to be of importance only in districts with predominantly cool and moist climate. For the control of the disease the substitution of the resistant *robusta* variety

for *W. filifera* proper and the removal of trunk cankers of *C. plumosa* at an early stage are recommended.

De Fluiter (H. J.). **Enkele minder bekende wortelschimmels van Koffie en Rubber.** [Some less familiar root fungi of Coffee and Rubber.]—*Bergcultures*, xiii, 8, pp. 236–243, 7 figs., 1939.

In the course of field inspections carried out in Java from 1935 to 1938 the writer made the following observations on some comparatively little known root fungi of coffee and rubber. An *Armillaria*, presumably *A. fuscipes* [sometimes regarded as *A. mellea*: *R.A.M.*, xiv, p. 454], was prevalent on coffee in plantations at altitudes of 1,300 to 1,600 m. above sea-level, the incidence of infection increasing parallel with the rise in elevation. The presence of the fungus may be recognized by the development of the usual characteristic longitudinal fissures up to 165 cm. in length on the stems, giving rise to the popular name of 'split canker'. Fruit bodies were neither observed in nature nor produced in culture. Control measures should consist in the early eradication and destruction of diseased bushes; cleaning of infected sites, which should be left fallow for a year before replanting; isolation of foci of disease by trenches 60 cm. in depth, enclosing a circle of healthy bushes besides the infected ones; and the application of sulphur to the plant holes shortly before or at planting.

In 1938 the fruit bodies of *Polyporus rugulosus* [ibid., xvi, p. 788], considered by Prof. Boedijn to be identical with *P. zonalis* [ibid., xv, p. 471; xvii, p. 88], were found in profusion on the root-collars and fallen leaves of rubber seedlings, but the fungus did not act as a parasite in the cases under observation, the wood remaining perfectly sound and no trace of penetration being detected.

Rubber bud grafts on an estate at the foot of the Raoeng mountains were attacked in 1937 by a species of *Rhizoctonia*, placed by Prof. Boedijn near *R. crocorum* [*Helicobasidium purpureum*], which caused the death of the cortex of the roots.

Bitancourt (A. A.). **Lesões nas frutas da mancha anular do Cafeeiro.** [Ring spot lesions on Coffee berries.]—*Biologico*, v, 2, pp. 33–34, 1 fig., 1939.

Attention is drawn to the recent detection on coffee berries in São Paulo, Brazil, of concentric chlorotic lesions, 1 to 6 mm. in diameter, tending to coalesce and become depressed in the later stages of the disease, which is tentatively attributed to a virus of the [tomato] spotted wilt group. Out of 50 berries collected at random, 14 were severely and 22 mildly affected.

Tharp (W. H.) & Young (V. H.). **Relation of soil moisture to Fusarium wilt of Cotton.**—*J. agric. Res.*, lviii, 1, pp. 47–61, 1 fig., 3 graphs, 1939.

Details are given of greenhouse experiments at the Arkansas Agricultural Experiment Station, in which was studied the relation of soil moisture (ranging from 20 to 100 per cent. of the water-holding capacity) to the incidence and severity of the *Fusarium vasinfectum* wilt of cotton [*R.A.M.*, xviii, p. 248] at the prevailing greenhouse tempera-

tures, and in one series at constant soil temperatures of 23°, 26°, 29°, and 32° C. All the tests were made on the susceptible Harper Mebane cotton variety, and the resistant Rhyne Cook was also used in one experiment. All the results with the susceptible variety showed a positive correlation of the disease with rise in moisture content to an optimum of 80 to 90 per cent., above which the correlation was negative up to 100 per cent. For the resistant variety there was little correlation of plants actually wilted with soil moisture content, total infection showing an irregular increase with rise in soil moisture over the entire range of moisture employed, with no relative reduction of disease from 90 to 100 per cent. of soil saturation. The P_H value of the inoculated soil at the different moisture levels underwent readjustment, until at the end of two experiments it showed a positive correlation with the moisture content; the fact, however, that the moisture level producing the highest percentage of disease caused but a slight change from the original P_H value would suggest the possibility that relative soil moisture and the P_H value of the soil may have an interrelated influence on the disease. In the constant soil temperature series the results further indicate the possibility of a similar combined effect on the wilt of soil moisture and soil temperature.

YEAGER (C. C.). **Empusa infections of the House-Fly in relation to moisture conditions of northern Idaho.**—*Mycologia*, xxxi, 2, pp. 154–156, 1939.

In studies on the infection of the house fly by the fungus *Empusa muscae* [*R.A.M.*, xviii, p. 140], conducted over a period of 17 months in 1936–7 at Moscow, Idaho, the presence of the fungus was determined by inducing conidial germination in flies, by glueing them to a pane of glass and inverting this over a moist chamber, or by placing the flies in various nutrient solutions. The prevalence of *E. muscae* infections was found to be directly correlated with the amount of rainfall; during a very wet June 43·6 per cent. of the 220 flies examined were found infected, while from July to November, with little rainfall, only 0·5 per cent. of the 600 flies examined showed any infection.

HORNBOSTEL (W.). **Kann Beauveria densa (Link) auch die Eier des Maikäfers befallen?** [Can *Beauveria densa* (Link) also attack the eggs of the Cockchafer?]—*Z. PflKrankh.*, xlix, 3, pp. 142–144, 3 figs., 1939.

Beauveria densa is known to attack the larvae, nymphs, and adults of the cockchafer [*Melolontha melolontha*: *R.A.M.*, xviii, p. 107], and the writer carried out experiments at the Bonn (Germany) Phytopathological Institute to determine the capacity of the fungus for infection of the eggs. Virulent strains of the organism, isolated from the mummies of infested cockchafers, grew well on various standard media, of which bouillon agar proved to be particularly suitable. Out of eight eggs inoculated with conidial suspensions of *B. densa* on 1st August, 1938, four were stored at 10° and the remainder at 22° to 27° C.; twelve days later all in the former lot and three out of the four in the latter bore the mycelium of the fungus and exuded a milky fluid on light pressure. In most cases reisolations from the egg surface

gave rise to characteristic cultures of *B. densa*. Coremia of the *Cordyceps* type were produced on the diseased eggs after four to six weeks at room temperature.

DRECHSLER (C.). **A few new Zoöpagaceae destructive to large soil rhizopods.**—*Mycologia*, xxxi, 2, pp. 128–153, 7 figs., 1939.

Latin and English diagnoses and full descriptions are given of three further species of Zoöpagaceae [*R.A.M.*, xvii, p. 597; cf. ibid., xviii, p. 310] destructive to large soil rhizopods and occurring in decayed plant remains in the United States, namely: *Cochlonema megalosomum* n.sp. destructive to *Amoeba verrucosa*, *C. bactrosporum* n.sp. destroying *Heleopera sylvatica*, and *Acaulopage marantica* n.sp. capturing and consuming *Amoeba terricola*.

WOLF (F. T.). **Sawada's discovery of Achlya flagellata as a parasite of fish.**—*Mycologia*, xxxi, 2, pp. 236–237, 1939.

Referring to a previous paper on the parasitism of *Achlya flagellata* on fish [*R.A.M.*, xvii, p. 319] the author wishes to correct the statement that this parasitism had not been previously known. It has since come to the author's knowledge that Sawada had published in 1912, entirely in Japanese, a report on the fungus *Achlya prolifera* parasitic on fish, this species being regarded by the author and by other workers as identical with *A. flagellata*.

CALDWELL (J. T.) & ROBERTS (J. D.). **Rhinosporidiosis in the United States: report of a case originating in Texas.**—*J. Amer. med. Ass.*, cx, 20, pp. 1641–1644, 5 figs., 1938.

Clinical details are given of a case of rhinosporidiosis in a 16-year-old schoolboy in Texas, associated with the presence in a polypus in the right side of the nasal septum of the perfectly round, encapsulated, cyst-like structures, 40 to 300 μ in diameter and containing numbers of spherical endospores, of *Rhinosporidium seeberi* [*R.A.M.*, xviii, p. 29 and next abstracts]. This is only the seventh record of the fungus for North America and the first for the south-west of the United States.

ANANT NARAYAN RAO (M.). **Rhinosporidiosis in bovines in the Madras Presidency, with a discussion on the probable modes of infection.**—*Indian J. vet. Sci.*, viii, pp. 187–198, 4 pl., 1938. [Abs. in *Bull. Inst. Pasteur*, xxxvii, 6, p. 374, 1939.]

In the Presidency of Madras the author has observed numerous cases of rhinosporidiosis in bovines and one in an equine [see next abstract]. The agent of the disease among bovines is probably the same as in man [*Rhinosporidium seeberi*: see preceding abstract], a detailed account of the life-history of which is given. The fungus probably occurs as a saprophyte in soil and infects both agricultural labourers (the chief sufferers from the disease) and oxen by means of the dust raised in field operations.

SAHAI (L.). **Rhinosporidiosis in equines.**—*Indian J. vet. Sci.*, viii, pp. 221–223, 2 pl., 1938. [Abs. in *Bull. Inst. Pasteur*, xxxvii, 6, pp. 374–375, 1939.]

A description is given of the life-history of *Rhinosporidium equi*

[*R.A.M.*, xvi, p. 462], nearly allied to *R. seeberi* [see preceding abstracts], which was isolated in India from a cauliflower-shaped tumour in the nasal cavity of a horse.

Jakl (J.). **Dermatomykosen bei Hunden.** [Canine dermatomycoses.] *Zvěrolék. Obz., 1938*, p. 221, 1938. [Czech. Abs. in *Zbl. Bakt.*, Abt. 1 (Ref.), cxxxii, 21–22, pp. 485–486, 1939.]

Pathogenic fungi were detected in only ten of the 105 dogs (9·5 per cent.) examined in Czechoslovakia for suspected mycoses, *Achorion quinckeanum* being present in three, *Microsporon lanosum* [*R.A.M.*, xvii, p. 599; xviii, p. 393] in five, and *Trichophyton vinosum* [ibid., x, p. 106] in two cases. Inoculation experiments on guinea-pigs gave positive results with the two first-named organisms, while the outcome with *T. vinosum* was negative. No morphological or biological differences could be discerned between the canine cultures and those derived from human sources, and transmission from dogs to man and vice versa is therefore probable.

Boers (E. R. J.), Kouwenaar (W.), & Wolff (J. W.). **Mycetoma pedis (Maduravoet).** [Mycetoma pedis (Madura foot).]—*Geneesk. Tijdschr. Ned.-Ind.*, lxxviii, 27, pp. 1606–1613, 7 figs., 1938. [English summary.]

From the black grains of the mycetoma in a case of Madura foot [cf. *R.A.M.*, xviii, p. 310] in a 50-year-old Punjabi male, resident for 20 years in Sumatra, a species of *Madurella* presenting many analogies with *M. americana* [ibid., vi, p. 112] was isolated on various media, of which potato-glycerine and bouillon proved more suitable than Sabouraud's agar, room temperature being the optimum for growth. Glucose and maltose were utilized with slight acid formation; gelatine was not liquefied; litmus whey underwent no change. On potato-glycerine the abundant growth is chocolate-brown, dry, cerebriform, coarsely furcate, without aerial mycelium, and very tenacious. The irregular, septate hyphae, 2 to 2·5 μ in diameter, secrete a brownish-black pigment, and at an advanced stage sclerotia and chlamydospores, 10 to 13 μ in diameter, are formed. This is believed to be the first case of Madura foot actually contracted in the Dutch East Indies.

Milochevitch (S.). **Dermatophyties et lutte contre ces affections en Yougoslavie.** [Dermatophytoses and the control of these disorders in Yugoslavia.]—*Bull. Off. int. Hyg. publ.*, xxx, 10, pp. 2333–2341, 1938.

The microscopic and cultural examination of dermatological material submitted by the regional hygienic organizations affiliated to the Central Institute of Hygiene of Yugoslavia showed the exclusive agent of microsporosis to be *Microsporon audouini* [*R.A.M.*, xvii, p. 244] of purely human origin (the fungus has not yet been isolated from animals in the country). During a period of nearly eight years, 526 cases of trichophytosis, 169 of microsporosis, and 224 of favus have been recorded. Generally speaking, dermatomycosis is more prevalent in the east than in the west. Microsporosis has been observed only in Belgrade and the Voivodina, favus occurs chiefly in Serbia, Montenegro, Bosnia,

and Herzegovina, while the distribution of trichophytosis is more widespread. On the whole, *M. audouini* seems to be gradually making its way from the west eastwards, whereas *Trichophyton violaceum* [loc. cit.] is slowly proceeding from eastern to western Europe. The last-named organism is the principal cause of trichophytosis, followed by *T. album* [loc. cit.], *Ctenomyces* [*T.*] *mentagrophytes*, *C. radiolatus* [*T. radiolatum*] [ibid., xvii, p. 680], *T. glabrum*, *T. immergens* [ibid., xvii, p. 818], *T. langeroni* [ibid., xiii, p. 577], *C. bossae* [ibid., xv, p. 297], and other species. *Achorion schoenleini* is the pathogen of favus, the symptoms of which may also be induced, however, by *T. album* [ibid., xv, p. 580] and *T. immergens*.

De Busscher (J.), Scherer (H. J.), & Thomas (F.). **La méningite à Torula.** [Meningitis due to *Torula*.]—*Rev. neurol.*, lxx, 2, pp. 149–168, 9 figs., 1938.

After summarizing Freeman's monograph (*J. Psych. Neurol.*, xliii, p. 236, 1931) of 43 observations on meningo-encephalitis caused by *Torula histolytica* [*Debaryomyces neoformans*: *R.A.M.*, xviii, p. 396], the writers describe at length and fully discuss a fatal case of the disease in a 28-year-old female factory worker in Belgium.

Quodbach (K.). **Ein Beitrag zur Pathologie der Blastomykose des Zentralnervensystems.** [A contribution to the pathology of blastomycosis of the central nervous system.]—*Zbl. allg. Path. path. Anat.*, lxix, 7, pp. 227–231, 3 figs., 1938.

Clinical details are given of a fatal case of blastomycosis (*Torula histolytica*) [*Debaryomyces neoformans*: see preceding and next abstracts] in a 37-year-old man at Rostock, Germany. The varying aspects of the organism appeared to be conditioned by its localization in different sites rather than by any fundamental instability. Attention is drawn to the very low degree of pathogenicity exercised by *D. neoformans* independently, the lethal outcome of blastomycosis (in Germany) being invariably preceded by some chronic disease—rheumatic pancarditis in the case under discussion.

Greenfield (J. G.), Martin (J. P.), & Moore (M. T.). **Meningo-encephalitis due to Cryptococcus meningitidis (Torula histolytica) with report of a case.**—*Lancet*, ccxxxv, 6012, pp. 1154–1157, 5 figs., 1938.

Full clinical details are given of a fatal case of meningo-encephalitis (for the causal organism of which the name *Cryptococcus meningitidis* is preferred to *Torula histolytica* [*Debaryomyces neoformans*: see preceding abstracts]) in an 18-year-old youth in London. The fungus is thought to have possibly gained entry through the broken skin of an injured finger.

Howell (A.). **Studies on Histoplasma capsulatum and similar form species. I. Morphology and development.**—*Mycologia*, xxxi, 2, pp. 191–216, 5 figs., 1939.

With the view of establishing the systematic position of *Histoplasma capsulatum* [*R.A.M.*, xvii, p. 816], causing histoplasmosis in man, a

comparative study was conducted with cultures of the fungus and of *Sepedonium chrysospermum*, *S. xylogenum*, *Chlamydomyces palmarum*, *Stephanoma tetracoccum*, and *Mycogone perniciosa* [ibid., xvii, p. 378]. The two genera *Histoplasma* and *Sepedonium* [ibid., xiv, pp. 234, 760] are both shown to form spores as bulbous enlargements of the terminal ends of terminal or lateral branches, but the former not only produces yeast-like bodies in its parasitic phase but also lacks phialospores during its saprophytic phase. The so-called asci of *Histoplasma* [ibid., xiv, p. 583] are shown to be aleuriospores and the 'ascospores' are merely fatty globules which stain readily and may be made to disappear by suitable reagents or by heating. It is suggested, therefore, that *Histoplasma* should at present be considered a separate genus in the Fungi Imperfecti.

KREUTZFELDT-PLATHE (R.). **Ueber den Stoffwechsel von Penicillium thomii Maire.** [On the metabolism of *Penicillium thomii* Maire.]—*Vorratspflege u. LebensmittForsch.*, ii, 2, pp. 87–120, 6 figs., 2 diags., 13 graphs, 1939.

Penicillium thomii [*R.A.M.*, xv, p. 183] having been found, in the course of intensive studies now proceeding at the Prussian Dairy Experiment and Research Station (Kiel), severely to impair the quality of stored butter, a comprehensive investigation on the metabolism of the mould was conducted under strictly controlled conditions and is here fully described and tabulated.

KOCHMAN (J.). **Choroby Lwiej Paszczy (Antirrhinum majus): rdza, Puccinia antirrhini Diet. et Holw. i plamistość liści, Phyllosticta antirrhini Syd.** [Diseases of Snapdragon (*Antirrhinum majus*): rust, *Puccinia antirrhini* Diet. & Holw. and leaf blight, *Phyllosticta antirrhini* Syd.].—*C.R. Soc. Sci. Varsovie*, xxxi, 4, pp. 136–159, 1 fig., 2 pl., 1938. [English summary. Received May, 1939.]

Rust (*Puccinia antirrhini*) of snapdragon (*Antirrhinum majus*) [*R.A.M.*, xviii, p. 413] was observed for the first time in Poland by Wróblewski in 1936. In experiments conducted by the author in Warsaw a larger number of uredospores germinated at 10° C. than at 18°, but whereas at 10° the germ-tubes began to appear after four hours, at 18° they appeared after two. The germ-tubes attained a length of 50 μ after five hours at 10° and of 150 μ at 18°. In the field, about 0·3 per cent. of the uredospores germinated in the spring after overwintering, the lowest temperature recorded during the winter being —24°. Artificial inoculation with uredospores was invariably successful after 10 to 12 days, while teleutospores failed to produce infection. The germination of uredospores of *P. antirrhini* was arrested, at a temperature of 16° to 18°, by 0·01 per cent. solutions of either lime-sulphur or colloidal sulphur, while much stronger concentrations of copper sprays were needed to achieve the same effect. Hybrids between the native susceptible varieties, All Gold, Rubin, Othello, and Kermesinum splendens, and a resistant American variety all showed complete resistance in the first generation and were of high commercial value. Spraying with colloidal sulphur (0·7 per cent.) or lime-sulphur (1 in 60) three times at ten-day intervals considerably reduced the amount of infection, while 1 per cent. Bordeaux mixture proved ineffective.

Phyllosticta antirrhini [ibid., xv, p. 559] is recorded for the first time in Poland on snapdragon plants in the glasshouse and in field plots in Warsaw.

Van Hell (W. F.). **Bladgrond en de Sclerotium ziekte.** [Leaf base and the *Sclerotium* disease.]—*Orchidee*, viii, 2, pp. 32–34, 1939.

Orchids of the genus *Paphiopedilum* are reported to have been attacked in Java by *Sclerotium rolfsii* [*R.A.M.*, xvii, p. 750], which invades the plants from the soil through the root-collar and under humid conditions rapidly extends to the leaves and destroys them. The sclerotia of the fungus have been experimentally shown to retain their viability for four years. Good control has been secured by immersion of the diseased plants (after careful removal of the sclerotia) in a 1 per cent. solution of copper sulphate and sterilization of the pots and soil by heat (15 minutes at 60° C.). The infected debris should also be immersed for 24 hours in a copper sulphate solution at 1 per cent. or stronger.

Matsumoto (T.) & Hirane (S.). **Two strains of Petunia mosaic.**—*Trans. nat. Hist. Soc. Formosa*, xxix, 184–185, pp. 1–12, 3 figs., 1939.

Two strains of *Petunia* mosaic virus [*R.A.M.*, vi, p. 431; cf. ibid., xvii, p. 600] are stated to occur in Taihoku, Formosa, Japan, one of which (A) produces more conspicuous vein-clearing in the incipient stage of the disease than (B), accompanied by chlorosis of the mesophyll tissues along the veins. The virulence of strain (A) is markedly less than that of (B), the incidence of infection in inoculation experiments being under 20 per cent. even at a concentration of 1 in 50 (unfiltered juice) and nil at 1 in 100. The infectivity of this strain is further much reduced by passage through a Berkefeld filter (N). Both strains are capable of attacking tomato, tobacco, *Nicotiana affinis* [*N. alata*], and *N. sanderae* in addition to their natural host, but their effects on *N. sanderae* are quite distinct, being characterized in the case of (B) by severe necrosis in place of a relatively mild foliar mottling. Strain (B) is very closely related serologically to the virus of ordinary tobacco mosaic, with which, in fact, it appears to be identical, whereas (A) reacts quite differently, being unable to produce antibodies to any appreciable extent and failing to respond to the antisera prepared from (B) or the tobacco mosaic virus. The leaf tissues of *Petunia* and tobacco plants infected by strain (B) contain the vacuolate bodies and plate-like crystals associated with tobacco mosaic, which have in no case been found in foliage attacked by (A). Cytological studies therefore give useful data for the differentiation of the two *Petunia* mosaic strains.

Di Micheli (G.). **L'oidio delle Ortensie in Italia.** [Hydrangea mildew in Italy.]—*Ann. Fac. agr. for. Firenze, 1937–8*, Ser. III, i, pp. 237–248, 3 pl., 1938. [Received March, 1939.]

In this paper the author gives a semi-popular account, with numerous references to the relevant literature, of the geographical distribution, symptoms, morphology, and control of hydrangea mildew (*Microsphaera polonica*) [*R.A.M.*, xvi, p. 679]. The disease was first observed in Italy

in 1932 in a glasshouse in Florence, and since then it has been seen in Piedmont and two other districts of Florence.

TOMPKINS (C. M.). **Two mosaic diseases of annual Stock.**—*J. agric. Res.*, lviii, 1, pp. 63–77, 7 figs., 1939.

An account is given of comparative studies of two virus diseases of annual stock (*Matthiola incana* var. *annua*) in California, the first of which, termed mild mosaic, was briefly described by the author in 1934 [*R.A.M.*, xiv, p. 172]; the second, severe mosaic, was first found in 1935 near San Pablo. Both diseases are chiefly characterized by flower 'breaking' and leaf mottling, the symptoms being more conspicuous in severe mosaic, and cause considerable losses to cut flower and seed crops in the cool coastal valleys of California. In nature both are transmitted by the turnip or false cabbage aphid (*Lipaphis pseudobrassicae*), and are also readily transmissible by juice inoculation into the leaves with carborundum; tests for transmission through the seed gave negative results. All self-coloured varieties of annual stock are highly susceptible to infection with both diseases, as indicated by leaf mottling and flower 'breaking'; leaf mottling was induced by inoculation in varieties with white or yellow flowers, but not 'breaking'. Both viruses were experimentally shown to infect, *inter alia*, turnip, black mustard, white mustard, dames violet (*Hesperis matronalis*), evening scented stock (*M. bicornis*), and Turkish and White Burley tobacco. On the other hand, Chinese mustard (*Brassica juncea*), pe-tsai (*B. pe-tsai*), radish, Virginian stock (*Malcomia maritima*), wallflower (*Cheiranthus cheiri*), and a number of other plants were only susceptible to the mild mosaic, whereas *Chenopodium album*, spinach, and *Petunia* were only infected by the severe mosaic; the fact that neither was infective to cabbage, cauliflower, kale, Brussels sprouts, sprouting broccoli, kohlrabi, rape, or rutabaga serves to differentiate them from certain other viruses of crucifers. Flower 'breaking' of annual stock may also be induced by the viruses of Chinese cabbage, turnip [ibid., xviii, p. 223], horse-radish, and cabbage mosaics, and that of cabbage black ring [ibid., xvii, p. 152].

Technical descriptions are given of the two viruses. The mild mosaic virus remained infectious for five days after storage at 22° C., and supported 1 in 4,000 dilution, whereas the severe mosaic retained infectivity for seven days and at dilutions up to 1 in 3,000. The inactivation temperature for each virus was between 58° and 60°.

MACDONALD (J. A.). **Powdery mildew on Cinerarias.**—*Gdnrs' Chron.*, cv, 2721, p. 111, 1 fig., 1939.

A note is given on an outbreak, believed to be the first recorded for Scotland, of powdery mildew (*Oidium* sp.) [? *Erysiphe cichoracearum*] on cinerarias [*R.A.M.*, ix, p. 595] at St. Andrews. Of 18 plants grown in the same greenhouse, the 12 of the Grandiflora strain were all attacked, while only one of the six Stellata contracted infection, which was confined to the stem. The seed of all the plants was obtained direct from an English firm, and it thus appears probable that the fungus is capable of infecting the developing fruits during the flowering period and surviving on them until the occurrence of germination in the following season.

KOTTHOFF [P.]. **Eine neue Pilzkrankheit an Edelginster.** [A new fungous disease of *Cytisus hybridus*.]—*Kranke Pflanze*, xvi, 2, pp. 24–26, 2 figs., 1939.

Ceratophorum setosum [*R.A.M.*, xviii, p. 116] has recently been isolated in Westphalia from *Sarothamnus* [*Cytisus*] *scoparius* [ibid., xvii, p. 686], largely used as a green manure and for the protection of young stands in forest nurseries, as well as from *C. hybridus*, on which the fungus is reported to cause heavy damage. Inoculation experiments with the mycelium from pure cultures (which made good growth on standard agar media and potato slices, but sporulated profusely only on the natural substratum) gave positive results on unwounded leaves of *C. laburnum* and yellow lupin (*Lupinus luteus*), while a potted *C. scoparius* plant was killed within a fortnight. The destruction of diseased material and repeated applications of 2 per cent. Bordeaux mixture are recommended.

STEYN (D. G.). **Fungus-infected and fermented feeds dangerous to stock.**—*Fmg S. Afr.*, xiv, 155, p. 69, 1939.

Details are given of recent cases of poisoning in live stock due to the consumption of fungus-infected feeds, symptoms of paralysis being induced by *Diplodia zeae* on maize cobs and stalks; hypersensitiveness, partial paralysis, respiratory trouble, and muscular spasms by *Claviceps* [*paspali*] on *Paspalum* [*dilatatum*: *R.A.M.*, xvii, p. 299]; and arthritis and visceral gout (in geese) by *Penicillium glaucum* on maize.

HINDMARSH (W. L.) & HART (L.). **Poisoning of cattle by ergotized Paspalum.**—*Vet. Res. Rep. N.S.W.*, *1937*, 7, pp. 78–88, 1938. [Abs. in *Chem. Abstr.*, xxxiii, 9, p. 3423, 1939.]

The toxicity of the *Paspalum* [*dilatatum*] ergot fungus [*Claviceps paspali*] to cattle, sheep, and horses [see preceding abstract] in New South Wales [*R.A.M.*, xvii, p. 326] appeared to reach a climax during the development of the sclerotia. Mature sclerotia were less toxic than the grass infested by the fungus at the time of ergot formation.

PESANTE (A.). **Prime ricerche sulla sistematica e sulla biologia delle 'Stromatineae' parassite dei fruttiferi in Italia.** [First researches on the systematic position and biology of the 'Stromatineae', parasites of fruit trees in Italy.]—*Ann. Fac. agr. for. Firenze*, *1937–8*, Ser. III, i, pp. 395–424, 9 pl., 7 figs., 1938. [Received March, 1939.]

This is an expanded account of work on *Stromatinia* [*Sclerotinia*] already noticed from another source [*R.A.M.*, xv, p. 233].

Mould in cool stores. Its cause, types, and prevention.—*Fruit World, Melbourne*, xl, 1, pp. 23–24, 1939.

This is a report of the address delivered by T. O. Mitchell to The Orchardists' and Fruit Cool Stores Association of Victoria, dealing with the practical aspects of the prevention of moulds (mainly *Penicillium* and *Aspergillus* spp.) in cool stores [*R.A.M.*, xvii, p. 614], where they are a constant source of infection to foodstuffs. The presence of moulds may be reduced to a negligible minimum by good sanitation, accurate adjustment of temperatures, avoiding those at which germination and growth of moulds can thrive, and finally by the use of antiseptics.

Shirlan AG and shirlan WS proved in New Zealand trials to be very effective in controlling moulds. Shirlan AG may be added to water-paints or used as a spray with water at the rate of 1 lb. in 30 gals. Shirlan WS is used at strengths of 0·01 to 0·1 per cent. solution for washing down walls or added to lime-wash paints or distempers. Sterilizing of cases at the beginning of the packing season by dipping in a hot or boiling solution of shirlan WS (1 lb. in 10 to 20 gals. water) not only destroys all the spores present in the cases but also prevents a subsequent invasion over a protracted period.

CHARLES (VERA K.). **A note on the occurrence of Marasmius pyrinus.** —*Mycologia*, xxxi, 2, pp. 228–230, 1 fig., 1939.

Marasmius pyrinus is recorded on the fruit of apple [*R.A.M.*, xvii, p. 737], collected by A. B. Groves at Winchester, Virginia, where it has been observed several times before, apparently always following arsenical spray injury.

MOORE (M. H.), STEER (W.), & SHAW (H.). **Recent work on fungicides and insecticides at East Malling.**—*Sci. Hort.*, vii, pp. 85–95, 1939.

Bordeaux mixture and other copper preparations caused injury to apple trees at East Malling even when used at such a low concentration that they were no longer satisfactory as fungicides. The spray programme recommended against apple scab [*Venturia inaequalis*: *R.A.M.*, xvii, p. 689] is 2½ per cent. lime-sulphur at green- and pink-bud, 1 per cent. at petal fall, and ¾ per cent. afterwards, as necessary, at fortnightly intervals; 0·5 per cent. colloidal sulphur may be used instead of lime-sulphur for post petal-fall applications. A zinc-lime mixture and tetramethylthiuram disulphide [loc. cit.] have both shown promise in the field and are to be further tested; the latter is about ten times as toxic to the spores of *V. inaequalis* as is the monosulphide.

The spray programme recommended against pear scab [*V. pirina*] is lime-sulphur (2½ per cent.) shortly after bud burst, and again at white bud, and Bordeaux mixture (4–6–100) with cottonseed oil (3 qts. per 100 gals.) at petal fall and again two or three weeks later.

Excellent control of brown rot of Morello cherries [*Sclerotinia laxa*] results from cutting out the infections in spring, and giving one application of tar oil (10 per cent.) late in January, and one of Bordeaux mixture (6–9–100) just before blossoming. With standard plums and sweet cherries, on which the removal of infections is not practicable, spraying should be resorted to when infection warrants it. The incidence of bacterial canker [*Pseudomonas mors-prunorum*: ibid., xvii, p. 693] on the susceptible Bigarreau de Schrecken cherry variety has for some years been greatly reduced by spraying with Bordeaux mixture once in autumn at a concentration of 10–15–100 and once in spring at one of 6–9–100.

Apple branch blister, formerly attributed to *Coniothecium chomatosporum* [ibid., xvii, p. 45], has been ascertained to be of physiological origin and associated with lack of moisture and available potash, and possibly other factors. It is most prevalent on Cox's Orange Pippin on No. 11 rootstock, especially on light, arid soils.

[This paper is reprinted in *Rep. E. Malling Res. Sta.*, *1938*, pp. 253–261, 1939.]

Holz (W.). **Eine Methode zur Prognose des Askosporenfluges von Fusicladium dendriticum (Wallr.) Fckl. (Vorläufige Mitteilung).** [A method for the prognosis of the ascospore flight of *Fusicladium dendriticum* (Wallr.) Fckl. (Preliminary note).]—*NachrBl. dtsch. PflSchDienst*, xix, 2, pp. 12–13, 1 graph, 1939.

A simple method has been devised at the Stade [North Germany] branch of the Biological Institute for the prognostication of the inception of ascospore discharge in the apple scab fungus (*Fusicladium dendriticum*) [*Venturia inaequalis*: *R.A.M.*, xvii, p. 464; xviii, p. 37]. Beginning in the middle of March, 1938, Boskoop leaves, overwintered in the open, were brought daily to the laboratory about 8 a.m., well moistened, and laid in a dish lined with damp blotting paper. To trap the liberated acospores three greased slides were laid on the leaves and left in the closed dishes for two hours, whereupon they were dried in the air and microscopically examined for acospores. By similar means the ascospores produced on foliage of the same variety, collected in flower pots and left out-of-doors, were caught, and the laboratory and garden results compared from time to time. The first ascospores were trapped in the laboratory on 16th March and in the open on the 24th, following rain. An immediate notification of the laboratory results would thus enable growers to utilize the interval regularly elapsing between indoor and outdoor ascospore production for the application of the first, and by common consent most important, fungicidal treatment. It is suggested that the method may be widely employed (naturally with due allowance for variations in climatic conditions) by plant protection stations, horticultural institutes, and the like.

Maier (W.). **Die fungizid wirksamen Kupfermengen bei der Blauspritzung der Obstbäume.** [The fungicidally active quantities of copper in the 'blue' spraying of fruit trees.]—*Z. PflKrankh.*, xlix, 3, pp. 160–176, 3 graphs, 1939.

A detailed, tabulated account is given of the writer's experimental observations in 1937 at the Geisenheim (Rhine) Research Institute on the fungicidally active quantities of copper in the rain water from nine pear trees—three standards (Stuttgart Gaishirtle, Giffard's Butter, and Summer Egg), three spindle pyramids (Holzfarbige Butter, Diel's Butter, and Hardenpont's Winter Butter), and three fan-trained (Esperens Bergamotte, Diel's Butter, and Hardenpont's Winter Butter) —treated against scab (*Venturia pirina*) by the so-called 'blue' spray (6 per cent. Bordeaux mixture) [*R.A.M.*, xvi, p. 542 *et passim*]. The standards received only one (dormant) application on 23rd March, while the two other groups were given a second treatment with 1 per cent. Bordeaux on 24th May. The copper determinations were made by Schachkeldjan's method (*Z. analyt. Chem.*, lxxxi, pp. 139–140, 1930), based on the colorimetric measurement of the raspberry colour produced in an ammonium-containing copper solution by the admixture of sodium salicylate with acetate of benzidine solution and calcium cyanide.

The amounts of copper detected in the rain water declined steadily from the first analysis on 21st April, when an average of 4·8 γ per c.c. (1 γ = 0·001 mg.) was calculated, to the last on 13th August (0·4 γ), though even by October the reserves were not completely exhausted,

as shown by the presence of traces of copper in the test-tubes on the 4th. The copper was washed off the fan-trained and pyramid trees much more rapidly than in the case of the standards. The minimum copper concentration found to arrest conidial germination and germ-tube extension in precipitation water from pear leaves was 1·2 γ per c.c., which in 17 hours at a temperature of about 20° C. after evaporation reduced the number of germinating conidia from 41·4 to 19 per cent. and the length of the germ-tubes from 123·1 to 83·2 μ. There is reason to believe, however, that smaller amounts would produce comparable results in nature.

The fundamental differences between the 'blue' method, applied in the dormant stage, and the standard Bordeaux schedule, including treatment of the trees in leaf, are discussed in relation to their practical significance. From the data obtained in the present trials the 'blue' spray would seem to confer adequate protection against infection before and during blossoming, but not against late scab, which will almost invariably require a special separate treatment. The 'blue' spray should be applied as late as possible in view of the liability of the copper deposits to washing off by spring rains. By periodical determinations of the copper content of the rain water from sprayed trees it may be possible to establish the critical date for the application of further treatments.

Kienholz (J[ess] R.). **Stony pit, a transmissible disease of Pears.**—*Phytopathology*, xxix, 3, pp. 260–267, 2 figs., 1939.

'Stony pit', a virus disease of pears, causes the development of gnarled or pitted fruit, the tissue at the base of the pits generally becoming necrotic and producing numerous sclerenchyma cells. On the Bosc variety fruit pitting is accompanied by a 'measled' condition of the bark, which at an advanced stage of the disorder resembles that of a mature oak. The cortical symptoms on the stock may precede those on the scion by several years, or vice versa. A faint mottling or the formation of chlorotic areas along the leaf veinlets also appears to be associated with 'stony pit', which did not yield to experimental treatments with zinc, copper, boron, or manganese. The disease, which causes losses of 10 to 80 per cent., was easily transmitted by infected Bosc buds to healthy Bosc and Anjou trees, the symptoms generally appearing in the second season after inoculation. Bartlett was shown by the same method to be tolerant or immune. 'Stony pit' is known to have been present in Oregon for many years and also occurs in California and Washington.

Yarwood (C. E.). **Powdery mildews of Peach and Rose.**—*Phytopathology*, xxix, 3, pp. 282–284, 1 fig., 1939.

Powdery mildews (*Sphaerotheca pannosa*) of peach and rose [*R.A.M.*, xvii, p. 693; cf. also ibid., xviii, p. 120] are stated to cause considerable damage in California. The former overwinters in part in diseased peach buds, which show systemic infection on emergence in the spring. In a test at Berkeley, 17 mildewed and 112 healthy leaf shoots had developed on 18th February, 1936, from 57 dormant twigs surface-sterilized and placed in plugged tubes on the previous 28th January.

The mildew makes slow progress on the leaves in the spring, but up to 97 per cent. infection was observed on walnut-sized fruits on 31st May, 1938. Circumstantial evidence only is forthcoming for the overwintering of *S. pannosa* in rose leaves and buds. Attempts to infect roses with the peach strain of *S. pannosa* resulted only in mycelial growth on detached leaflets of Briarcliff, Belle of Portugal, and Pernet in 10 per cent. sucrose solution, while the conidia of the rose strain merely penetrated the peach leaf cells without proceeding further. Moreover, the average dimensions of 90 rose leaf conidia were 27·4 by 14·2 μ compared with 23·4 by 13·4 μ for the same number from peach foliage. Ornamental peach leaves suffering from curl (*Taphrina deformans*) have been found to contract mildew much more readily than healthy ones.

Straňák (F.) & Blattný (C.). **Důležití a významní škodliví činitelé kulturních rostlin v Čechách ve vegetační sezoně 1937–1938.**—[Important and significant pests and diseases of cultivated plants in Czechoslovakia during the vegetative season 1937–1938.]—*Ochr. Rost.*, xv, 2, pp. 3–11, 1939. [German summary.]

In this report [cf. *R.A.M.*, xvii, p. 500] *Phyllosticta mali* [ibid., xvi, p. 564] is stated to have been frequently observed on apples, and *P.* [*Phoma*] *prunicola* [ibid., xvi, p. 106] widespread on plums. Mosaic diseases of peach and other *Prunus* spp. have been almost entirely eliminated from nurseries. Several isolated cases of vine mosaic [ibid., xvi, p. 299] are reported from some vineyards near Mělník.

Rogers (W. S.), King (Mary E.), & Massee (A. M.). **Results of researches on Strawberry growing.**—*Sci. Hort.*, vii, pp. 71–84, 3 pl., 2 figs., 1939.

Further work at East Malling has shown that strawberry xanthosis in California and yellow edge in England are probably identical [*R.A.M.*, xvi, p. 762; xviii, pp. 326, 402]. The symptoms of yellow edge on Royal Sovereign become masked at certain seasons and develop at other times, while the symptoms on other varieties also vary. Even the so-called 'symptomless carriers' show signs of infection at certain seasons, and may deteriorate as much as the Royal Sovereign variety. The susceptible varieties, Little Scarlet, Deutsch Evern, Royal Sovereign, The Duke, Sir Joseph Paxton, Stirling Castle, and Pillnitz should not be grown with varieties of 'intermediate' or 'carrier' groups, the former consisting of Axbridge Early, Madame Kooi, Laxton, Western Queen, Scarlet Queen, Early Cambridge (Boyes' Seedling), Jucunda, and Tardive de Léopold, and the latter of Madame Lefebvre, Oberschlesien, Huxley, Bedford Champion, and Super.

Mild crinkle [ibid., xvii, p. 694; xviii, p. 402] is certainly widely distributed through existing strawberry stocks, but it causes scarcely any damage. It need not be rogued from runner beds. Severe crinkle [loc. cit.], on the other hand, must be eliminated, though the exact stage at which the disease becomes serious is difficult to define, as the intermediate symptoms between severe and mild crinkle might belong to either. Plants showing intermediate symptoms should be rogued out as soon as definite signs of severe crinkle appear. On *Fragaria vesca* crinkle produces small blisters on the leaves, accompanied by chlorotic

speckling and curling. Plants affected with yellow edge may also be infected with crinkle, though the latter condition may often not be apparent. [This paper is reprinted in *Rep. E. Malling Res. Sta., 1938*, pp. 223–234, 3 pl., 2 figs., 1939.]

CARTER (W.). **Geographical distribution of yellow spot of Pineapples.**—*Phytopathology*, xxix, 3, pp. 285–287, 1 fig., 1939.

Both the widely cultivated Queen pineapple and the scattered plantings of Cayenne in the Bathurst district of South Africa were observed in November, 1937, to be affected by a disorder externally indistinguishable from the yellow spot of Hawaii [*R.A.M.*, xvii, p. 828]. The relatively high incidence of fruit symptoms (necessitating the rejection of 10 per cent. prior to shipment to the fresh fruit market in one instance) and the very slight involvement of the leaves and crowns point to a flower-feeding insect as the vector of the disease. In this connexion mention is made of the detection of *Frankliniella schultzei*, an important carrier of 'kromnek' [ibid., xvii, p. 442], in the pineapple flowers, and of 'kromnek'-diseased weeds in the pineapple plantations. Dr. E[nid] S. Moore is stated recently to have obtained evidence of the identity of 'kromnek' with tomato spotted wilt.

A visit to the Philippine Islands in May, 1938, failed to reveal any evidence of yellow spot either on pineapple or the species of *Emilia* serving as a local weed host, while *Thrips tabaci*, the supposed insect vector, was also missing. The symptoms reported by Serrano as caused by yellow spot [ibid., xv, p. 378] are attributed by the author to a hitherto undescribed disease of an entirely different character.

YARWOOD (C. E.). **Control of powdery mildews with a water spray.**—*Phytopathology*, xxix, 3, pp. 288–290, 1939.

The known deleterious action of rain on certain powdery mildews [*R.A.M.*, xvi, p. 105] suggested the possibility of combating diseases of this group by means of a water spray. Water at about 70 lb. pressure was applied in the late afternoon at appropriate intervals for varying periods with sufficient force to obtain a washing effect for a few seconds in each treatment. The following results were obtained. The percentages of leaves infected by *Oidium euonymi-japonici* on *Euonymus japonicus* [ibid., xii, p. 578] and by *Sphaerotheca pannosa* on Dorothy Perkins rose [see above, p. 463] were reduced from 78 to 33 and from 72 to 21, respectively; in the cases of *Erysiphe cichoracearum* on two plants of cucumber [ibid., xvii, p. 585] (sprayed 3 and 6 days after inoculation), *E. polygoni* on four Pinto beans [*Phaseolus vulgaris*: ibid., xvi, pp. 104, 363] (daily for 11 days), and *E. graminis* on 75 plants of barley [ibid., xvi, p. 104; xvii, p. 807] (9 and 11 days after inoculation), the numbers of mildew colonies were reduced from 615 to 0, 1,600 to 20, and 1,228 to 42, respectively. Care must be taken to avoid water-soaking of the leaves in beans and cucumbers.

HORSFALL (J. G.) & HARRISON (A. L.). **Effect of Bordeaux mixture and its various elements on transpiration.**—*J. agric. Res.*, lviii, 6, pp. 423–443, 1 fig., 3 graphs, 1939.

The effect of Bordeaux mixture on the transpiration [*R.A.M.*, xviii, p. 352] was studied on tomatoes and beans (*Phaseolus vulgaris*) in the

greenhouse in winter. High temperature during the application of the spray was found to increase the rate of transpiration, while the temperature on succeeding days had little effect. The transpiration was increased by both the alkaline (hydrated lime alone) and the acid (Bancroft clay alone) materials tested. It was also increased by an improvement in the coverage and the filming qualities of Bordeaux. Desiccation of cut shoots and injury to transplants increased with spray load irrespective of the copper and lime contents of the spray, while the transpiration of potted plants rose with the spray load only to a point of about two parts of lime to one part of copper and then decreased sharply. Cottonseed oil emulsion alone or in combination with red cuprous oxide reduced the transpiration rate below that of unsprayed leaves. Bordeaux reduced the cuticular resistance to water loss and apparently clogged the stomata. On the basis of these results and facts available in the literature the following tentative hypothesis to account for the Bordeaux-induced transpirations is proposed: the alkalinity induced by Bordeaux mixture saponifies the cuticle and decreases its resistance to water loss (the acid spray achieving the same result by oxidizing the cuticle), but on the other hand it may clog some stomata, and is further apt to cool the leaf in bright weather; the balance between these factors will determine the increase in transpiration. It is suggested that in the field cuticles may be so thick and hard as to resist saponification and then the factors for reduced water loss may predominate.

NIEMEYER (L.). **Fortlaufend arbeitendes Kurznassbeizgerät 'Neusaat-Automatik' System Dipl.-Ing. Ott der Fa. F. Neuhaus G.m.b.H., Eberswalde.** [A continuously working short disinfection steeping apparatus 'Neusaat-Automatic' on the system of Dipl.-Ing. Ott of the firm of F. Neuhaus, Ltd., Eberswalde.]—*Masch. u. Geräteprüf. Reichsnährst.* (Suppl. to *Tech. in d. Landw.*), iv, 2, p. 17, 1 fig., 1939.

In collaboration with S. Reeh, K. Ebertz, and A. Winkelmann the writer tested the 'Neusaat-Automatic' short disinfection steeping machine (F. Neuhaus, Eberswalde), which is provided with a contrivance for the automatic distribution of the fungicide over the seed-grain as it flows into the cylinder. Satisfactory results were obtained with the appliance, which treats 250 to 1,500 kg. seed-grain per hour and costs RM. 356.

BIRAGHI (A.). **Determinazione della presenza di fluoro nei tessuti vegetali colpiti da emanazioni gassose.** [Determination of the presence of fluorine in plant tissues injured by gaseous emanations.]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 3, pp. 360–366, 1 pl., 1938 (issued 1939).

Microchemical tests on olive leaves injured by fluorine compounds [*R.A.M.*, xvi, p. 701] in the smoke emitted by glassworks in the vicinity of the trees showed that the injured areas gave an abundant precipitate of hexagonal crystals of sodium fluorosilicate on the addition of appropriate reagents. Crystals of the same material were also obtained from apparently healthy leaves on the same branches, while apparently normal leaves from olives 200 to 250 m. distant from the glassworks showed the presence of a few similar crystals. None was found,

however, in healthy leaves obtained from a locality remote from the fumes in question.

Setterstrom (C.) & Zimmerman (P. W.). **Factors influencing susceptibility of plants to sulphur dioxide injury. I.**—*Contr. Boyce Thompson Inst.*, x, 2, pp. 155–181, 1 fig., 1939.

In this paper the influence of various environmental factors on the susceptibility of plants to sulphur dioxide injury is reviewed and the data, supplemented by new results from 29 factorial experiments with buckwheat and lucerne, are summarized as follows. Plants are much more resistant to sulphur dioxide at 40° F. or below than at higher temperatures; susceptibility does not, however, vary appreciably between 65° and 105°. In general, an increase in relative humidity leads to a decrease of resistance to sulphur dioxide, although in the range above 40 per cent. saturation a difference of at least 20 per cent. is needed to cause a noticeable change in susceptibility. Plants grown in soil amply supplied with water after fumigation are more susceptible than those supplied with little water, and poor soil and heavy shading are other conditions favouring injury. Young plants are more resistant than older ones.

Craigie (J. H.). **Economic diseases of field crops in Manitoba.**—*Contr. Bot. Pl. Path., Dep. Agric., Ottawa*, 574, 37 pp., 20 figs., 2 maps, 1939.

This is a semi-popular survey of fungous, bacterial, and virus diseases of cereals, beans, peas, flax, maize, potato, and hay crops in Manitoba. Particular stress is laid on the economic importance of the diseases, and estimates of the losses entailed are given. Control methods are briefly discussed.

Nakata (K.) & Hino (I.). **New system of phytopathology.** Volume I.—ii+254 pp., 112 figs., Tokyo, Yôkendô, 1938. Yen 3·30. [Japanese. Received May, 1939.]

The first volume of the authors' new system of phytopathology (of which a further four are stated to be in course of preparation) falls into two parts, one introductory, dealing with general aspects of the subject, and the other tracing the history of phytopathology in foreign countries (from earliest times) and Japan, discussing phytopathological organizations, legislation, and the trend of phytopathology, and giving also a review of the literature and a bibliography.

Chistiakoff (F. M.) & Bocharova (Mme Z. Z.). Влияние низких температур на микроорганизмы. II. IV. Влияние низких температур на развитие плесневых грибков. [The influence of low temperatures on micro-organisms. II. IV. The influence of low temperatures on mould development.]—*Микробиол.* [*Microbiol.*], vii, 4, pp. 498–514; 7, pp. 838–842, 1 fig., 1 graph, 1938. [English summaries. Received April, 1939.]

A fully tabulated account is given of the writer's studies at the Moscow Refrigeration Research Institute on the influence of low temperatures on mould growth on stored foodstuffs, which showed that the minimum temperature for the development of the fungi concerned lies well below 0° C. Delay in the appearance of visible growth and in

conidial formation increased *pari passu* with a decline in temperature and reached a maximum just before the limit of total inhibition. The following were the most resistant to low temperatures: *Penicillium glaucum*, *Mucor* sp., *Botrytis cinerea*, *Cladosporium herbarum* (developing freely at −5°), *Chaetostylium fresenii* (from white sturgeon in a refrigerator), *Monilia nigra*, *Thamnidium elegans* [*R.A.M.*, xviii, p. 255], and *Fusarium culmorum*.

No mould growth was observed during a period of 19 months at −18° and −12°, and at −8° fungal development occurred only on isolated pieces of meat and fish contracting infection during storage. On beef wort agar visible growth of *C. fresenii* became apparent only after 13 months, the corresponding period for development on fresh beef being only eight months after inoculation and transference to the storage chamber. On the other hand, *T. elegans* failed to develop after a year on fresh beef, whereas on wort agar visible growth appeared on the 54th day.

Sheffield (F[rances] M. L.). **Micrurgical studies on virus-infected plants.**—*Proc. roy. Soc.*, Ser. B, cxxvi, 845, pp. 529–538, 1 pl., 1939.

The results of the examination of cells of several Solanaceous plants, both virus-infected and healthy, by micromanipulative methods [*R.A.M.*, xiv, p. 799] are described. No differences in hydrogen-ion concentration were observed between healthy and diseased plants in any type of cell. The amorphous intracellular inclusions of aucuba mosaic of tomato disintegrated immediately on slight mechanical pressure on the outside of the cell or on puncturing with a very fine needle. The inclusions appeared to be almost unaffected by acids over a range of P_H from 7 to 2·2, although in the more acid solutions they withstood maltreatment better than in a neutral one. Their stability seemed to depend on the osmotic pressure: at 0·1 M the inclusions persisted, at 0·07 M they disintegrated gradually, and below 0·05 M very rapidly. It was impossible to isolate the striate material of tobacco and enation mosaics, as the slightest pressure on the outside of the cell or pricking caused the plate-like crystals to break down into needle-like fibres.

Blunck (H.). **Viruskrankheiten bei Pflanzen.** [Virus diseases of plants.]—*Z. PflKrankh.*, xlix, 3, pp. 177–222, 1939.

This is a comprehensive survey, supplemented by an eight-page bibliography, of outstanding recent contributions to the knowledge of virus diseases of plants, discussed under various aspects, such as the nature of the infective principles, symptomatology, modes of transmission, analogies with human and animal viruses, technical methods of examination, molecular dimensions and weights, chemical, serological, and pathogenic properties of the crystalline proteins resulting from ultracentrifugation, and the arguments for and against the conception of the viruses as living entities.

Butler (E. J.). **The occurrences and systematic position of the vesicular-arbuscular type of mycorrhizal fungi.**—*Trans. Brit. mycol. Soc.*, xii, 3–4, pp. 274–301, 1 pl., 3 figs., 1939.

This paper deals with the distribution and morphological characters of the vesicular-arbuscular or Phycomycetoid endophytes [*R.A.M.*,

xvii, p. 698] which commonly occur in cultivated and probably other soils, forming mycorrhizal associations in the roots of many flowering plants and cryptogams, including prothalli of liverworts and of some ferns. The regularity of their occurrence in some perennial plants and their incidental presence in some annual field crops are believed to be merely the result of the greater opportunity to persist indefinitely, by passing from the older to later developed roots, offered to the organism in perennial plants. The extramatrical mycelium of the fungus is described as consisting of usually stout, tortuous-angular hyphae marked by characteristic unilateral angular projections, the hyphae being at first hyaline and thin-walled, but frequently becoming honey-yellow and thick-walled later by internal deposition of material, being then rigid and rather brittle. Septa are irregular and usually sparse or even absent from considerable parts of the mycelium; when present they may separate segments of a hypha which persists and presumably helps to secure the vegetative propagation of the fungus. The entry of the fungus generally takes place through a cell of the epidermis of the young root behind the meristematic region or through a root hair, the hyphae usually passing down through one or two layers of cells and then either entering the intercellular spaces of the cortex or continuing within the cells, or both. The characteristic organs of these fungi, the vesicles and the arbuscular-sporangiolar apparatus, are regarded as being mainly concerned with the accumulation of fatty material (possibly with accessory nutrients) and its transference to the higher plant. The vesicles, when present, develop terminally, or are rarely intercalary, on the intramatrical mycelium, whether this is in or between the cells, and on the mycelium around the roots, and may be oval, pear-shaped, round, or irregular. Their distinguishing character is their open communication with the hypha on which they are borne. A basal septum is not normally formed. The wall of the vesicle is at first thin and colourless, but it thickens by the deposition of one or more layers on the inside, and then may turn pale yellow to brownish. The size of the vesicles is variable; the largest seen by Janse (1896) were 135 by 35 μ in *Schismatoglottis* and 100 by 27 μ in *Piddingtonia*, and the smallest were up to 20 by 20 μ in *Cotylanthera* and up to 30 μ in *Turpinia*. Although probably several allied species of fungi are involved in this type of mycorrhiza, it is not possible on the basis of present knowledge to distinguish them by any constant morphological feature such as the size or shape of the vesicles. The arbuscule-sporangiole apparatus develops wholly within the cells and is always produced, being often confined to the inner cortical layers. The arbuscule arises from any part of the main hyphae. The primary branch may be stout or fine or merely a short projection from the side of a coiled hypha; it usually divides within the cell and ends in a close brush of filaments not exceeding 0·5 μ in diameter, each bearing a sporangiole, a very thin-walled sac which soon looses its smooth contour and becomes lumpy or mammillate, and then undergoes some kind of change ending in its contents, largely of a fatty nature, becoming mingled with those of the host cell. Records of the presence of fungi of this type in fossils are briefly reviewed and their discovery in material from the glacial clays underlying peat bogs ('muskegs') near Edmonton, Alberta, described.

The author's attempts to grow these fungi have been confined to the external mycelium and vesicles, and though fine, hyaline, new hyphae were sometimes obtained, they did not grow extensively. The new growth was invariably obtained from the old thick-walled hyphae, either as a lateral outgrowth or from a broken end, and though several of these old hyphae were attached to mature vesicles, the vesicle itself was not observed to germinate. Considerable differences of opinion are stated to exist regarding the identity of this group of fungi. In the author's view, which supports Peyronel's, these endophytes probably belong to species of the Endogonaceae, which have often lost the power of forming the compound fructifications common to the family. In the characteristics of the hyphae and the 'chlamydospores' or vesicles, the Endogonaceae are stated to show more resemblances to the group under consideration than any other fungi known to the author. It is, however, admitted that, pending further details of Peyronel's work, the proof of these conclusions is not yet fully established. Dangeard's (1900) account and figures of *Rhizophagus populinus*, a new genus and species set up by him in 1896 to define the endophyte as it occurs in poplars, leave no room for doubt that he was dealing with a typical member of the group. *Rhizophagus* thus appears to be the first legitimate name given to the present-day endophytes of the vesicular-arbuscular type in their imperfect condition, and may most satisfactorily be regarded as an imperfect genus of the Endogonaceae with at present only the named species *R. populinus*, *R. theae* (Zimm.) n.comb. (syn. *Protomyces theae* Zimmermann), and *R. marattiacearum* (West) n.comb. (syn. *Stigeosporium marattiacearum* West) [ibid., v, p. 571].

Magrou (J.). **Nouveaux essais de culture des champignons de mycorrhizes.** [New cultural experiments with mycorrhizal fungi.]—*C. R. Acad. Sci., Paris*, ccviii, 12, pp. 923–925, 1 fig., 1939.

Continuing his experiments with the endophyte of *Arum maculatum* [*R.A.M.*, xv, p. 243 and cf. preceding abstract], the writer found that a more luxuriant development than that hitherto obtained, accompanied in some instances by incipient arbuscule formation, could be induced by the provision of aneurin (vitamin B_1), which was added to the soil extract either in the form of 3 per mille groundnut peptone or 10 per mille autolysate of beer yeast. The medium, adjusted to P_H 6·6, was further enriched by biotin [ibid., xviii, p. 336] (three drops of alcoholic solution of yolk of egg per 10 c.c.), a filtered extract of macerated *Arum* roots, and in some cases by a millionth part of indoleacetic acid. The endophyte developed in 46 out of 52 cultures in Van Tieghem cells made during May (88 per cent.). Analogous results were secured in preliminary tests with the mycorrhiza of *Scilla bifolia*, *Veratrum album*, and *Solanum dulcamara*.

Malan (C. E.). **Ricerche sui tubercoli radicoli e sulle micorize delle Leguminose alpine.** [Researches on the root tubercles and mycorrhiza of Alpine legumes.]—*Ann. Bot., Roma*, xxi, 3, pp. 465–494, 1938. [Received March, 1939.]

A study is described on the mycorrhiza of wild leguminous plants growing in the Alps in beech forests (including, among others, *Vicia*

cracca, *V. sativa*, *V. sepium*, *Trifolium medium*, *T. repens*, *T. pratense*, and *Lotus corniculatus*), in forests of larch (*Larix decidua*) (chiefly *L. corniculatus* and *T.* spp.), in glades in both types of forest (in which the leguminous plants found were similar to those in the respective forests), and in pastures (including *Corylus*, *Alnus*, *Rhododendron*, and *Vaccinium* spp.). The results showed that in all the Leguminosae studied endotrophic mycorrhiza with hyphae of the Phycomycetoid type [see preceding abstracts] predominated. Only in Leguminosae from glades on argillaceous soil was the endophyte of the *Rhizoctonia* type also observed, invariably associated with the Phycomycete.

Mycorrhizal development was greatest in the roots of Leguminosae growing in the forests and on leguminous hosts growing among Ericaceae, though it was also abundant on legumes growing along the higher edges of pastures. In cells invaded by the mycelium starch appears only when the hyphae undergo digestion. During its most vigorous period, the mycorrhiza feeds mainly on carbohydrates, hydrolysing starch and preventing its condensation until the root tissue has become infected. Numerous observations showed that the mycorrhiza never come into contact with the nitrogen nodules or with parts of the root in close proximity to them.

Sempio (C.). **Influenza della luce e dell' oscurità sui principali periodi del parassitamento. Studio condotto su alcune malattie fungine di piante coltivate.** [The influence of light and darkness on the principal periods of parasitism. A study carried out on some fungal diseases of cultivated plants.]—*Riv. Pat. veg.*, xxix, 1–2, pp. 1–69, 8 pl., 7 graphs, 1939.

A detailed account is given of studies carried out to ascertain the effects of darkness upon certain fungal diseases of plants during each of the three main periods of infection [*R.A.M.*, xviii, p. 48], namely, one to three or four days from the moment of inoculation, from the third to the sixth or the fourth to the seventh, and from the seventh to the ninth or tenth day, the first period covering germination of the spores, penetration of the promycelium into the host, and the initiation of parasitism, the second, spread of the mycelium in the host tissues (the 'central' phase of parasitism), and the third the maturation of the mycelium and the development and release of the fruit bodies. The diseases studied were *Bremia lactucae* on lettuce, *Cystopus candidus* on red radish, *Erysiphe graminis* and *Puccinia triticina* on wheat, and *Uromyces appendiculatus* on Cinquantino giallo beans. The potted seedlings when 15 to 20 days old were sprinkled with an aqueous suspension of the spores of the fungi and then placed for two days under glass covers. In each experiment four pots were used, one being exposed to darkness for the first, second, or third period of infection and kept under normal environmental conditions the rest of the time, while the fourth or control pot remained under normal conditions of light throughout.

The results obtained showed that exposure to darkness during the first period of infection in general stimulated infection, which was markedly more intense than in the controls. Exposure to darkness during the second period of infection had a retarding effect, infection

in nearly all cases being about equal to that of the controls. Exposure to darkness during the third period generally gave much less severe infection than in the controls.

VANTERPOOL (T. C.). **Homothallism in Pythium.**—*Mycologia*, xxxi, 2, pp. 124–127, 1939.

A study of single zoospore cultures (developed from single zoospores located on the surface of an agar plate, after distribution of a zoospore suspension) of *Pythium arrhenomanes* [see above, p. 449], *P. butleri* [*R.A.M.*, xviii, p. 89], *P. myriotylum* [ibid., xvii, p. 294], *P. torulosum* [ibid., xvii, p. 736], *P. complectens* [ibid., xvii, p. 297], and *Phytophthora cactorum* [ibid., xviii, p. 129] showed all these species to be strictly homothallic (monoecious, hermaphroditic, self-fertile).

KÖHLER (E.). **Zur Differenzierung des A- und Y-Virus im Infektionsversuch.** [On the differentiation of the A- and Y-viruses in inoculation experiments.]—*Naturwissenschaften*, xxvii, 13, p. 215, 1939.

The ordinary tobacco test is stated to be very unreliable for the differentiation of weak strains of the potato virus Y and strong ones of A [*R.A.M.*, xvii, p. 834]. It has recently been ascertained that *Nicotiana glutinosa* is immune from A but highly susceptible to Y, so that the use of this plant facilitates the separation of the two viruses in inoculation experiments without risk of confusion, a matter of particular importance in connexion with plant-breeding operations.

HEINZE (K.). **Spritzversuche zur Abtötung von Kartoffelkraut als Abwehrmassnahme gegen Viruskrankheiten.** [Spraying experiments in the destruction of Potato tops as a means of defence against virus diseases.]—*Z. PflKrankh.*, xlix, 3, pp. 129–142, 3 figs., 1939.

In experiments on the control of potato virus diseases by the chemical destruction of foliage, the author found that the following sprays were very effective and also killed the aphids: a mixture of 2·5 per cent. each cresol and fruit tree carbolineum, one of cresol and Baumspritzmittel of the same strength, and 3 to 10 per cent. sodium chlorate with 0·1 per cent. nicotine and a spreader. [An account of this work also appears in *NachrBl. dtsch. PflSchDienst*, xviii, 12, pp. 103–105, 1 fig., 1938.]

ROZENDAAL (A.). **Enkele opmerkingen over een virusziekte bij de Aardappelvariëteit Eersteling, en het verband met de stippelstreekziekte.** [Some observations on a virus disease of the Duke of York Potato variety and its relation to stipple streak disease.]—*Landbouwk. Tijdschr., Wageningen*, l, 619, pp. 1063–1088, 15 figs., 1938. [English summary. Received May, 1939.]

A severe mosaic of Duke of York potatoes, characterized in the primary phase by mottling and extensive crinkling of the uppermost leaves and fine, brown necroses along the veins on the under side, and in the secondary by small, necrotic spots on the petioles and main stem, has been observed of recent years in certain parts of Holland. The necrotic appearance of the foliage imparts a faint resemblance to stipple streak [*R.A.M.*, xvii, p. 126; xviii, p. 337], but careful examination

reveals well-defined differences in the configuration of the stippled and necrotic areas in the two diseases. Moreover, the tubers of stipple streak-infected plants show superficial necrotic lesions and 'eye disease' (resulting in the death of numerous eyes), these features being generally absent from the new Duke of York virus disease. Comparative inoculation experiments (by stem-grafting and sap transference), conducted with this virus and virus Y, resulted in the production of identical symptoms, and the Duke of York mosaic is therefore attributed to virus Y, not reported hitherto for Holland.

A detailed description is given of the reactions (classified in five groups) of a number of well-known potato varieties to tuber-grafting with virus Y. Representative of group (A), characterized by mosaic and drooping of the leaf tips and margins, but no necrosis, are Arran Crest, Arran Victory, Eigenheimer, Epicure, Iris, July Kidney, May Queen, Roode Star, Belle de Fontenay, Bloemgraafje, Gladblaadje, Thorbecke, and Zealand Blue, of which the five last-named invariably harbour stipple streak, Thorbecke and Zealand Blue without external manifestations. Group (B), comprising the varieties Alberta, Bintje, Duke of York, Furore, Gruno, and Triumph, reacts to infection by mosaic, drooping of the leaf tips and margins, a certain amount of rugosity, a few fine veinal necroses, a yellowish to bronze discoloration of the lower leaves, and little or no leaf drop streak. Similar symptoms to the foregoing, with the addition of leaf drop streak, are typical of group (C), comprising Albion, Institut de Beauvais, and Magdeburg Blue. Group (D), besides the features already mentioned, is characterized by numerous superficial stem necroses; it includes Alpha, Bevelander, British Queen, Erdgold, Flava, Friso, Goldwährung, Green Mountain, Industrie, Irish Cobbler, Ninetyfold, President, Preussen, Sickingen, Souvenir, and Up-to-Date. Symptoms reminiscent of stipple streak typify the reaction to virus Y of the group (E) varieties—Dunbar, Yeoman, Monocraat, Noordeling, and Populair; they consist of little or no mosaic, severe, dark, veinal necroses, some necrotic stippling, extensive stem necroses, and leaf drop streak.

It is apparent from these observations that virus Y is equally destructive with stipple streak in respect of foliar damage, but it is less injurious to the tubers, except in the cases of Bevelander and Noordeling, which undergo necrosis as a result of infection by Y but do not respond in this way to stipple streak. The most dangerous attribute of Y, however, is its high degree of infectiousness and ready dissemination by *Myzus persicae*, which is much less active in the spread of stipple streak. Virus Y is also transmissible by sap inoculations, which are seldom successful in the case of stipple streak.

EDDINS (A. H.). **Adjusting P_H reactions of soils with sulfur and limestone to control brown rot of Potatoes.**—*Amer. Potato J.*, xvi, 1, pp. 6–16, 1 graph, 1939.

Continuing his experiments at Hastings, Florida, in the control of potato brown rot or bacterial wilt (*Bacterium solanacearum*) [*R.A.M.*, xvi, p. 271; cf. also xviii, p. 52], the writer confirmed the beneficial results previously reported of a summer (June) application of sulphur at the rate of 800 lb. per acre, followed in November by 3,000 lb.

limestone. Inoculated and commercial flour sulphur produced approximately identical changes in the fine sand or sandy loam soil reaction when used at comparable rates. Tests showed that each 100 lb. sulphur changed the reaction by about P_H 0·15 at 400 lb. and by 0·2 at 500, 600, or 800 lb. per acre. Equal quantities of calcium and dolomitic limestone, applied to sulphured soil, produced about the same changes in the P_H reactions, the maximum yields of healthy potatoes on soils reduced to P_H 3·8 to 3·9 being obtained by treatments of 3,000 lb. limestone per acre.

BERTRAM (L.). **Die Alternaria-Knollenfäule der Kartoffel.** [The *Alternaria* tuber rot of the Potato.]—*Kranke Pflanze*, xvi, 2, pp. 26–32, 2 figs., 1939.

In the autumn of 1937 the Bonn Plant Protection Station received a number of inquiries concerning a tuber rot of Erstling [Duke of York] potatoes, which was found on investigation to be due to *Alternaria solani* [*R.A.M.*, xviii, p. 340] and to occur exclusively on material imported into the Rhine Province from Brandenburg, Pomerania, Grenzmark, and Oldenburg. In 1938 sporadic infection was also observed on Rhenish Duke of York and East Prussian Früheste Delikatess.

In order to ascertain whether infection can be conveyed from diseased to healthy tubers six sound, unwounded tubers were each placed on 22nd November, 1937, in contact with a diseased one; six healthy, lightly scraped tubers were similarly brought into contact with infected ones; and six sound, uninjured tubers were placed next to six healthy ones. No trace of infection was discernible on 10th January, 1938, or in some cases on 21st March, when the tubers were examined. In another test 3 kg. each of diseased and sound tubers were packed in alternate layers in two boxes, and stored in two cellars. In neither instance was there any transmission of infection from the diseased to the healthy tubers, and it seems improbable from these results that the fungus spreads in such a manner during storage, though stored tubers with an externally sound appearance but actually in the incipient phase of the rot may develop infection. From other data it seems unlikely that *A. solani* paves the way to any appreciable degree for secondary rots.

To test the value for seed purposes of tubers infected by *A. solani*, six severely diseased and six healthy were planted on 7th April in a humus-sand-peat mixture in Mitscherlich pots. Not only did the diseased tubers germinate as rapidly and well as the sound ones but they even gave a slightly larger average yield (450 gm. as against 426 gm. per pot). In a field trial the yields per plot of 22·5 sq. m. on 27th August from material planted on 7th May in sandy loam soil were as follows: healthy, stored cool, 64·83 kg.; diseased, stored cold, 62·27; healthy, stored warm, 35·83; and diseased, stored warm, 31·40. There was no trace of *Alternaria* infection on any of the lots of laboratory or field test material on 1st December, 1938, so it may safely be concluded that the quality of infected seed is not depreciated. A further experiment demonstrated the inability of the fungus to infect healthy tubers through diseased soil. It is probable that weather conditions play an important part in the development of *A. solani* on potato tubers, but

further information on the mode of transmission of the rot is necessary for the adoption of rational control measures.

Cook (H. T.) & Nugent (T. J.). **The influence of acid-forming and non-acid-forming fertilizer on the development of Potato scab.**—*Amer. Potato J.*, xvi, 1, pp. 1–5, 1939.

Observations at the Virginia Truck Experiment Station indicate that the incidence and severity of potato scab [*Actinomyces scabies*] are correlated with the soil reaction [*R.A.M.*, xviii, p. 412], being influenced by the type of fertilizer applied only to the extent of any change in the reaction thus induced. Since the disease is able to develop between P_H 4·85 and 5 but not at more acid reactions, future recommendations for local control should aim at the adjustment of the hydrogen-ion concentration to about P_H 4·8, followed by the use of non-acid-forming fertilizers to counteract excess of acidity. The application of acid-forming fertilizers may be advisable on soils where the disease has been so prevalent as materially to impair the quality of the crop, but scab will not be prevented until the reaction has been lowered to at least P_H 4·8. In the 1938 experiments on sandy loam the average scab indices for acid-forming fertilizers at P_H 4·45 to 4·6, 4·65 to 4·8, 4·85 to 5, 5·05 to 5·2, 5·25 to 5·35, and 5·4 to 5·65 were 0, 0, 5·84, 7·79, 12·25, and 40·70, respectively, the corresponding figures for non-acid-forming mixtures being 0·86, 0, 1·60, 9·18, 13·60, and 24·40, respectively.

Reddick (D.). **Scab immunity.**—*Amer. Potato J.*, xvi, 3, pp. 71–75, 1939.

Solanum commersonii, *S. chacoense*, *S. caldasii* var. *glabrescens*, *S. jamesii*, and an unnamed variety have been grown for two years (1937–8) in soil heavily infested by scab (*Actinomyces scabies*) [see preceding abstract] at Cornell, New York, without contracting the disease. All these species possess some very undesirable characters, such as late maturity, long stolons, and bitter flavour (*commersonii* group), which it is hoped to remedy by back-crossing with suitable commercial varieties.

Hill (L. M.). **A study of suberin and suberized deposits of diseased Potato tubers.**—*Phytopathology*, xxix, 3, pp. 274–282, 3 figs., 1939.

Methods are described for determining the difference between suberin and suberized deposit occurring in lesions in potato tubers suffering from several diseases. The petrographical microscope was used to supplement various microchemical tests for the detection of suberin and cellulose in the cell walls. The suberin is anisotropic in normal and wound periderm and in the corky cells surrounding the necrotic areas. The suberized deposit laid down on, or infiltrated in, a cellulose matrix is isotropic, and results from the oxidation and condensation of cell sap drying on the cellulose walls of cells associated with wound periderm and necrosis. Cutin was not found to be associated with necrosis in the diseased tubers examined. The study of the necrotic lesions is facilitated by the distinctive optical properties of cutin, suberin, suberized deposits, and cellulose.

HÉRISSON-LAPARRE (E.). **Influence du superphosphate de chaux sur la maladie des taches brunes de la Pomme de terre.** [The influence of superphosphate of lime on the brown spot disease of the Potato.]—*C. R. Acad. Agric. Fr.*, xxv, 1, pp. 45–47, 1939.

The potato disease described by German investigators under the name of 'iron spot' ['Eisenfleckigkeit': *R.A.M.*, xviii, p. 339] has hitherto received little attention in France, and in 1938 the writer therefore organized some preliminary experiments in its control in the Ariège Department by the application to the soil of a superphosphate of lime fertilizer. A highly satisfactory degree of control is stated to have been obtained by the incorporation with the soil, a month before planting, of 1,000 kg. lime and 400 kg. superphosphate of lime per hect. To cite two examples: in a field of Ackersegen potatoes at an altitude of 850 m. above sea-level, partly on infracretaceous crystalline and partly on Devonian carboniferous soil, one out of five tubers from the plants on the untreated portion was diseased, whereas not a single lesion developed on those receiving superphosphate; untreated Institut de Beauvais plants at an altitude of 1,050 m. on crystalline rock and mica-schist yielded tubers with such numerous spots as to be totally unmarketable, while those from a plot fertilized as above were perfectly clean. One of the farmers participating in the tests reported that 'Eisenfleckigkeit' scarcely ever developed on potatoes following clover, to which phosphoric acid is regularly applied.

GARRETT (S. D.). **Soil-borne fungi and the control of root disease.**—*Tech. Commun. Bur. Soil Sci., Harpenden*, 38, 54 pp., 1939.

The author reviews and critically discusses, with numerous references to the relevant literature, some of the more important investigations [most of which have been noticed from time to time in this *Review*] recently carried out in different countries on the control of a large number of soil-borne fungal diseases of crop plants. The main topics dealt with include the part played by fungi in the soil, plant sanitation, the elimination of infectious material from the soil by fungicides and heat treatment, mechanical methods, crop rotation, and biological control, the adjustment of soil conditions to check parasitic activity, and the increasing of host resistance by modifications in environment. The paper concludes with an eight-page bibliography.

WAKSMAN (S. A.), CORDON (T. C.), & HULPOI (N.). **Influence of temperature upon the microbiological population and decomposition processes in composts of stable manure.**—*Soil Sci.*, xlvii, 2, pp. 83–98, 7 pl., 2 graphs, 1939.

The authors show that the conservation of essential nutrient elements, especially nitrogen, in stable manures depends on the control, by regulation of temperature, of the rapidity of decomposition of the compost [*R.A.M.*, xviii, p. 342]. Nitrogen was conserved only when immediate decomposition set in, and was lost when delay occurred through too high or too low temperatures. Decomposition was most rapid at 65° C., when bacteria and Actinomycetes were mainly concerned; followed by that at 50°, when thermophilic fungi [loc. cit.] were very active in addition. Temperatures of 75° and 28° were unfavourable.

Masalab (N. A.). Болезни лекарственных и некоторых технических растений, вызываемые видами **Sclerotinia.** [Diseases of medicinal and of some industrial plants caused by species of *Sclerotinia*.] —*Sovetsk. Bot., 1938*, 6, pp. 67–83, 3 figs., 1 graph, 1938. [Received April, 1939.]

The author states that a severe damping-off of tobacco and pyrethrum [*Chrysanthemum cinerariaefolium*] seedlings is caused in the Crimea by *Sclerotinia sclerotiorum* and *S. minor* [*R.A.M.*, xvii, pp. 128, 433], this being, so far as he is aware, the first record of *S. minor* in U.S.S.R. *S. sclerotiorum* has also been found in the Crimea attacking the opium poppy, valerian [*Valeriana officinalis*], and fullers' teasel (*Dipsacus fullonum*), all three of which are new hosts for this fungus. Observations showed that the sclerotia of both species produce fully mature apothecia in nature every year under the local conditions. *S. minor*, both in pure culture and in nature, forms numerous sclerotia, which were shown to be capable of germinating without any rest period. Sclerotia associated with a wilt of *Trachyspermum copticum*, a stem and collar rot of *Gentiana lutea*, and a die-back of *Cassia obovata* were shown in culture to belong to species of *Botrytis*, and were never observed to produce apothecia either in nature or in culture.

Francis (C. B.). **Sugarcane smut.**—*Madras agric. J.*, xxvi, 12, pp. 468–474, 1938. [Received April, 1939.]

A popular account is given of sugar-cane smut (*Ustilago scitaminea*) in Madras [*R.A.M.*, xvii, p. 501] and its control by the removal of diseased material from the field and its destruction by 15 minutes' immersion in boiling water. Since 1934–5 regular searches have been made for infected plants on the estates of the East India Distilleries and Sugar Factories, Ltd., Nellikupam, starting about May and finishing towards the end of the year, with the result that the incidence has declined from 1,099 over 150 acres (average per acre 7) in 1935–6 to 55 over 112 acres (under one per two acres) in 1937–8; up to the end of August, 1938, 156 cases were found over 108 acres, the cost of the work amounting to under 8 annas per acre as compared with Rs. 1.12.8 in 1935–6. In 1934–5 the average number of Badilla canes removed was 540 per acre (all inspections), the corresponding figures for Co. 281 and P.O.J. 2878 being 119 and 16, respectively; in 1937–8 only five plants per acre of Badilla, one of Co. 281, and none of P.O.J. 2878 had to be eliminated for smut. In 1937 similar inspections were instituted among the peasants' cane, the removals among which amounted to 152, 51, and 14 per acre for Badilla, Co. 281, and P.O.J. 2878, respectively. Endomychid beetles are believed to carry the smut spores on their bodies and so asist in the spread of infection.

Martin (J. P.). **Pathology.**—*Rep. Hawaii. Sug. Exp. Sta., 1938* (ex *Proc. Hawaii. Sug. Pl. Ass., 1938*), pp. 30–38, 1939.

In this report [cf. *R.A.M.*, xvii, p. 487] it is stated, *inter alia*, that brown stripe (*Cochliobolus stenospilus*) [ibid., xv, p. 397] of sugar-cane was still of major importance in certain localities of Hawaii. In general, sugar-cane varieties exhibit little resistance to the disease.

Chlorotic streak of sugar-cane [ibid., xviii, p. 274], associated with high soil moisture and sometimes with potassium deficiency, was more prevalent along the Hilo coast of Hawaii than in former years. For the control of this disease it is recommended to use only healthy cuttings for planting or in doubtful cases to treat them in hot water (52° C. for 20 minutes) prior to planting.

The incidence of sugar-cane mosaic [ibid., xviii, p. 346] is stated to have been the lowest for many years, owing mainly to the planting of resistant varieties, the selection of healthy planting material, and roguing diseased plants.

Bacterium solanacearum [see above, p. 473], causing bacterial or brown rot of potatoes, was found in pot experiments to be carried in the soil, since plants grown in infested soil contracted the disease while those grown in steam-sterilized soil remained healthy. A parasitic organism closely resembling *Bact. solanacearum* was isolated from purslane (*Portulaca oleracea*).

Naumov [Naoumoff] (N. A.). **Clés des Mucorinées (Mucorales).** [Keys to the Mucorineae (Mucorales).] Translated from the second Russian edition, with additional notes by the author, by S. Buchet and I. Mouraviev, with a preface by P. Allorge.—(*Encycl. mycol.*, Vol. IX), 137+xxxvi pp., 82 figs., Paris, Paul Lechevalier, Editeur, 1939. 100 francs.

This French translation of Naoumoff's Key to the Mucorales [*R.A.M.*, xv, p. 56] includes nearly double the number of figures given in the original, drawn by Buchet to a larger scale. An appendix has also been added by the same translator setting out the differences between the author's views and those expressed by Zycha in his 'Kryptogamenflora der Mark Brandenburg' (1935), summing up the present state of knowledge on the sexuality of the fungi dealt with, and giving a full bibliography of works presenting the original diagnoses of the species or details of their sexual characters.

Marchionatto (J. B.). **Notas micologicas.** [Mycological notes.]—*Physis, B. Aires*, xv, pp. 133–144, 9 pl., 1939.

An annotated list is given of 27 species of Argentine fungi, of which the following may be mentioned: *Asperisporium caricae* on papaw [*R.A.M.*, xvi, p. 729]; *Cephalothecium* [*Trichothecium*] *roseum* on cotton bolls; *Cercospora epicoccoides* on *Eucalyptus globulus* [ibid., xiv, p. 471] and *E. rostrata*; *C. cichorii* on chicory [ibid., x, p. 430]; *Cladosporium paeoniae* on peony (*Paeonia sinensis*) [*P. albiflora*: ibid., xvi, pp. 20, 464]; *Entyloma dahliae* on dahlia [ibid., xvii, pp. 294, 752]; *Fabraea maculata* on pear [ibid., xviii, p. 259]; *Gloeosporium cyclaminis* on *Cyclamen persicum* [ibid., xv, p. 657]; the imperfect stage (*Phoma uvicola*) of *Guignardia bidwellii* on the vine [ibid., xvii, p. 727]; *Mycosphaerella rubi* [ibid., xvii, p. 190] and *Elsinoe veneta* on raspberries; *Sclerotinia opuntiarum* on *Opuntia* spp.; *Sclerotium bataticola* [*Macrophomina phaseoli*] on maize [ibid., xiii, p. 571]; *Spondylocladium atrovirens* on potatoes; and *Taphrina aurea* on *Populus* sp. [ibid., xvi, p. 642].

PEYRONEL (B.). **La forma basidiofora ('Helicobasidium purpureum' Pat.) della Rhizoctonia violacea in Italia.** [The basidium-bearing stage (*Helicobasidium purpureum* Pat.) of *Rhizoctonia violacea* in Italy.]—*Nuovo G. bot. ital.*, N.S., xlvi, 1, pp. 146–148, 1939.

The author records, for the first time in Italy, the presence of *Helicobasidium purpureum* (the perfect form of *Rhizoctonia crocorum*), found in the province of Siena on the collar of *Acer campestre* and *Urtica dioica* [*R.A.M.*, xii, p. 353]. In the author's opinion, the development of the fungus was favoured by the humidity of the soil, its richness in organic material, and its acidity [cf. ibid., ix, p. 667]. Control would appear to consist in liming or in the application of alkaline dressings, especially calcium cyanamide.

CARTWRIGHT (K. St. G.). **Presidential address. The relation between field and laboratory work in mycology.**—*Trans. Brit. mycol. Soc.*, xxii, 3–4, pp. 222–238, 1939.

In his presidential address to the British Mycological Society in September, 1937, the author emphasizes the need for the encouragement of systematic mycology and critically discusses some of the criteria used in the classification of the Polypores, stressing the value of cultures in the identification of wood-rotting fungi.

MATSUMOTO (T.). **Mites in relation to leaf curl-like Tobacco disease.**—*Trans. nat. Hist. Soc. Formosa*, xxix, 187, pp. 90–91, 1939.

Referring to his previous studies [*R.A.M.*, xvii, p. 629] on the leaf curl or 'kroepoek'-like disease of tobacco the author states that the appearance of glossy areas on the lower surface of diseased leaves has been found to be due to injuries made by the mites observed to be present. His interpretation of the results of his experiments on the mode of transmission was based on this symptom as a criterion of infection and therefore refers to the attack of the animal parasite and not to the virus. There is no doubt that the mite, possibly a species of *Tarsonemus*, is responsible for the stunting of plants as well as for the shiny appearance and leaf curl, but since infected plants have frequently produced new curled or malformed, lustreless leaves even after the removal of diseased material and treatment of the plants with nicotine sulphate, it is thought that a virus may occasionally be implicated in the causation of the disorder.

VINSON (C. G.), MCREYNOLDS (D. K.), & GINGRICH (N. S.). **Virus protein of mosaic disease of Tobacco.**—*Res. Bull. Mo. agric. Exp. Sta.* 297, 12 pp., 1 fig., 1 diag., 1 graph, 1939.

In a study on the virus of tobacco mosaic [*R.A.M.*, xviii, p. 415], carried out in Missouri in 1937, crystalline-like preparations of the virus were isolated from the juice of diseased plants and from more highly purified fractions of the virus by adding anhydrous sodium sulphate after the reaction had been adjusted to P_H 4·0. The crystalline material was almost entirely freed from ash by washing with dilute acetic acid. The ash content of the washed crystals was between 0·32 and 1·52 per cent., that of nitrogen between 15·8 and 16·2 per cent.,

and phosphorus was also present. The material can easily be freed from the last traces of brown pigment normal to juice of tobacco plants by shaking a phosphate dispersion with ether, whereupon the pigment is carried along on the droplets of ether and can readily be drawn off. The crystalline bodies averaged 30 to 40 by 1 μ, but longer particles were obtained with more concentrated solutions of the virus (1 to 2 per cent.). The crystalline material was easily redispersed and recrystallized any number of times. Fifteen X-ray diffraction patterns obtained with samples of the crystalline material showed spacings as great as 14·3 Å and as low as 2·43 Å, thus disagreeing with the spacings greater than 14·3 Å and not smaller than 3·39 Å observed by Wyckoff and Corey [ibid., xvi, p. 281] in virus material prepared according to Stanley's method. It is suggested that the absence of long spacings in the virus material prepared by the sodium sulphate method may indicate that it is composed of smaller molecules, and hence has a lower molecular weight than that studied by others.

PINCKARD (J. A.) & BOZOVAISKY (L.). **The effect of flue-curing on the infectivity of ordinary Tobacco mosaic virus (Tobacco virus 1).**—*Phytopathology*, xxix, 3, pp. 242–250, 2 graphs, 1939.

Following a severe epidemic at Chatham, Virginia, in 1937, the tobacco mosaic virus (tobacco virus 1) was experimentally shown to retain its virulence in flue-cured leaves [*R.A.M.*, xiii, p. 189] removed from the lower, middle, and upper tiers of the first four barns cured and in the lower and middle tiers but not upper tiers of the fifth. It was completely inactivated in the lower tiers of seven barns of cured tobacco in 1937, but the final drying temperatures (180° F. and upwards for 24 hours) at this position were substantially higher than those normally required for curing. Wide temperature variations (up to 50° F.) were recorded within the same wood-fired barns. The maximum temperatures reached in five barns cured with an oil-burning heating unit in 1938 ranged from 167° to 175° and were thus below the thermal death-point of the tobacco mosaic virus. Infected leaves lost weight, cured, and became dry at the same temperature and time as healthy foliage. The temperatures requisite for a satisfactory 'cure' varied, the leaves attaining the desired condition in one instance at 158° after 73 hours, and in three others at 175°, 130°, and 183° after 80, 111, and 84 hours, respectively; as indicated above, these figures are in general appreciably below the thermal death-point and time necessary for total virus inactivation.

THORNBERRY (H. H.) & MCKINNEY (H. H.). **Purification of Nicotiana virus 6 protein.**—*Phytopathology*, xxix, 3, pp. 250–260, 1 fig., 1939.

Canary Island material of *Nicotiana* virus 6, the agent of mild, dark green mosaic of tobacco [*R.A.M.*, ix, p. 260; xvii, p. 706] was purified from crude plant juice by crystallization at P_H 4·5 and 0·3 saturation of ammonium sulphate, using a modification [ibid., xvii, p. 416] of Stanley's improved method [ibid., xvi, p. 211]. Infectivity of the diseased plant (Wisconsin Havana seed tobacco) juice was associated with the presence of a protein resistant to tryptic digestion [ibid., xvii, p. 630], elemental analysis of which (after dialysis) indicated 13·28

per cent. nitrogen, no phosphorus, and 0·16 per cent. sulphur, the corresponding figures for non-dialysed protein being 11·90, 0·33, and 1·33 per cent., respectively. Under dark-field illumination the unit crystals of the protein are elliptical particles, 0·3 to 1·6 by 0·3 to 0·5 μ, whereas those of *N.* virus 1 are acicular and measure 3·2 to 4·2 by 0·4 to 0·5 μ [ibid., xvi, p. 570 *et passim*]. Both virus proteins, on standing, aggregate into threads [ibid., xviii, p. 211] or bundles of unit crystals. *N.* virus 6 was dispersed at P_H 7·5 to a point at which no particles were discernible, and precipitated at P_H 4·5 into elliptical crystals. At intermediate hydrogen-ion concentrations the dimensions and numbers of the precipitated particles bore a direct proportion to the degree of acidity. At P_H 7·5 in the presence of trypsin, the protein was precipitated into typical crystals.

KAUSCHE (G. A.). **Über die Bildung von hexagonalen Viruskristallen aus Suspensionen des Tabakmosaikvirus in vitro.** [On the formation of hexagonal virus crystals from suspensions of the Tobacco mosaic virus *in vitro*.]—*Naturwissenschaften*, xxvii, 5, pp. 77–78, 2 figs., 1939.

In order to verify Helen Purdy-Beale's working hypothesis that the hexagonal crystals in the epidermal cells and trichomes of mosaic-diseased tobacco plants are products of supersaturated protein solutions [*R.A.M.*, xvi, pp. 282, 569; xviii, p. 416], the writer made a microscopic study of the expressed sap of infected plants, purified with animal charcoal and mixed with the virus-containing centrifuged sediment precipitated with ammonium sulphate. The hexagonal crystals were observed to develop out of the fasciculate acicular deposits, thereby supporting the above-mentioned hypothesis and affording the first definite proof of the ability of the virus, under appropriate conditions, to pass *in vitro* from one form to the other.

SCHWEIZER (J.). **Jaarverslag Tabak over Juli 1937 t/m Juni 1938.** [Annual report on Tobacco from July, 1937, to June, 1938.]—*Meded. besoek. Proefst.* 62, 59 pp., 1938.

The following items (other than those already noticed from a different source) are of interest in the phytopathological section (pp. 37–40) of this report [cf. *R.A.M.*, xvi, p. 413] from Java. Tjemara (frenching) was present in tobacco plantations on soils of a particular constitution [ibid., xvii, p. 847]; experimental evidence points to thallium toxicity as an important factor in the etiology of the disturbance.

Mosaic and kroepoek or krekoh [leaf curl: ibid., xvii, p. 629; xviii, p. 90] were among the most prevalent virus diseases.

Stem rot [or hollow stem] (*Bacillus* [*Erwinia*] *aroideae*) [ibid., xvii, pp. 296, 490] developed locally during harvesting in a dry spell when the precaution of heating the barns had been omitted. Slime disease (*Bacterium solanacearum*) [ibid., xviii, p. 279] occurred in a severe form in tobacco stands following the susceptible groundnut, and was also unusually widespread on rice fields; generally speaking, however, the disease is of little importance in the Besoeki region.

Phytophthora parasitica var. *nicotianae* [ibid., xviii, p. 419] developed in an erratic manner in the abnormal weather conditions obtaining

during the period under review, injurious attacks being observed in areas where heavy rains were succeeded by short dry intervals, while practically no spread of infection took place where lengthy periods of drought followed the wet season. Not only old harvested leaves, but also young ones were seriously damaged by *Cercospora nicotianae*, which further infected the growing crop with unprecedented severity during the wet weather.

GRATZ (L. O.) & KINCAID (R. R.). **Tests of cigar-wrapper Tobacco varieties resistant to blackshank.**—*Bull. Fla agric. Exp. Sta.* 326, 18 pp., 1 fig., 1938. [Received May, 1939.]

In field tests conducted in Florida from 1933 to 1936 inclusive, the cigar-wrapper tobacco varieties 301, 94–2, 94–4, and Rg proved to be highly resistant to black shank (*Phytophthora parasitica* var. *nicotianae*) [see preceding abstract], the percentage of plants wilted or killed by the disease during the tests averaging 5·0, 8·25, 11·0, and 2·5, respectively, compared with 62·75 in the susceptible control (Connecticut Round Tip). Rg, closely followed by 301, was also found to be somewhat superior to others in quality and other important characteristics.

KINCAID (R. R.) & TISDALE (W. B.). **Downy mildew (blue mold) of Tobacco.**—*Bull. Fla agric. Exp. Sta.* 330, 28 pp., 11 figs., 1 map, 1939.

This is a semi-popular account of the downy mildew disease of tobacco (*Peronospora tabacina*) [*R.A.M.*, xviii, p. 417] in Florida, where it first appeared in 1921, then disappeared till the general outbreak in 1931, and has been prevalent every year since. The symptoms of the disease in the plant bed and the field, the influence of weather on the development of the disease, and the life-history of the causal fungus are described. Control measures recommended for use in the State include cultural practices, spraying with copper oxide-oil emulsion sprays, and vapour treatment with either benzol or paradichlorobenzene. The relative effectiveness and the costs of various treatments are discussed.

WOLF (F. A.). **Downy mildew of Tobacco in Brazil.**—*Phytopathology*, xxix, 3, p. 291, 1939.

About a year before the time of writing the author was informed that downy mildew had occasioned serious losses during two seasons on tobacco seedlings in the State of Rio Grande do Sul, Brazil. Material collected in September, 1938, and forwarded to the author showed glabrous oospores of *Peronospora tabacina* [see preceding abstract] distinct from those of *P. nicotianae*, first collected at Buenos Aires [*R.A.M.*, iv, p. 573] by Spegazzini in 1888. *P. tabacina* is thought to be of recent introduction into South America.

TROTTER (A.). **I Ficomiceti parassiti della pianta del Tabacco.** [Phycomycetes parasitic on the Tobacco plant.]—*Boll. tec. Tab.*, xxxv, 4, pp. 187–219, 4 pl., 10 figs., 1938. [English summary. Received April, 1939.]

This is a copiously annotated list of 18 Phycomycetes pathogenic to

cultivated tobacco, of which so far only *Asterocystis radicis* [*R.A.M.*, xv, p. 751] and *Pythium de Baryanum* have been definitely recorded for Italy, where the occurrence of *Olpidium brassicae* [ibid., xvi, p. 822], however, is also considered to be probable.

HOPKINS (J. C. F.). **Diseases of Tobacco in Southern Rhodesia. (Supplement I. 1932 to 1938.)**—*Rhod. agric. J.*, xxxvi, 1, pp. 45–65, 4 pl. (1 col.), 1939.

This is a supplement to the author's handbook on the diseases of tobacco in Southern Rhodesia published by the Department of Agriculture in 1931 [*R.A.M.*, xi, p. 206]. During the last six or seven years a distinct improvement in disease control is stated to have taken place owing to the growing experience of tobacco farmers in diagnosing diseases in their early stages and to the adoption of spraying both in seed-beds and lands as a general practice. Such diseases as wildfire [*Bacterium tabacum*: ibid., xvi, p. 2], angular spot [*Bact. angulatum*: ibid., xvii, p. 776], and brown spot (*Alternaria longipes*) [ibid., xviii, p. 373] no longer ruin whole districts or crops, but are kept under reasonable control if treated in their early stages. Although priming has been repeatedly proved to keep frog-eye [*Cercospora nicotianae*: loc. cit.] in check, there appears to be no appreciable reduction in the average yearly damage caused by it, the majority of growers being still unaware that the industry loses not less than £100,000 annually through this disease in the field and barn.

Since 1931 *Pythium de Baryanum* and *P. ultimum* have been found to cause damping-off of tobacco seedlings in addition to *Rhizoctonia* [*Corticium*] *solani*, but neither of the two has yet been observed affecting transplants.

The brown spot disease, for which the name *Alternaria longipes* (Ell. & Ev.) Tisd. & Wadk. has been adopted [ibid., xii, p. 748], has spread since 1931 throughout the country, despite all efforts to keep it under control, and occurs in the most severe form on red soils of the middle veld. The disease is favoured by high atmospheric humidity with frequent rains, and by relatively high temperatures [cf. ibid., x, p. 764]; above 80° F. the disease develops in its most severe form, while below 75° it does not become epidemic. Heavy-bodied leaves were found to be more susceptible than bright ones. Experimental inoculations produced very severe infection on fire-cured (Western) tobacco growing on red soil, but only a very mild one on the flue-cured Orinoco White Stem variety growing in sandy loam, identical results being obtained with a culture of the fungus received from Nyasaland. Field experience showed that successful control of the brown spot disease must aim at prevention of spore formation during the active growth of the plant. Severe epidemics and much damage are most likely to occur if the disease becomes widespread before topping and if spots are allowed to become numerous on the lower leaves; hence the importance of early diagnosis and rapid action. Priming should be commenced at the first signs of the disease and spotted leaves removed and destroyed by burning before abundant spore formation sets in. In conjunction with priming and destroying the first infected leaves, spraying with Bordeaux mixture or dusting with copper-lime dust,

repeatedly if necessary, when the plants are still young, has become a successful routine practice in certain districts. Affected stalks and seed pods should be destroyed immediately after reaping, as the fungus may hibernate in the infected tissues. In ploughing in crop residue all stalks must be carefully turned under. It is as yet uncertain whether or not the fungus is entirely killed by three months' composting. Seed capsules are attacked by the fungus, but the possibility of seed infection is considered negligible, as all seeds are bagged early in the season whilst the plants are still in flower. Seed treatment should in any case prevent the transmission of disease by this means. Brown spot has not yet been recorded in seed-beds in Rhodesia.

Van Koot (Y.). **De belangrijkste virusziekten van de Tomaat in Nederland.** [The most important virus diseases of the Tomato in the Netherlands.]—*Meded. Inst. Phytopath., Wageningen*, 83, 25 pp., 6 figs., 1939. [English summary.]

The most widespread virus disease of tomato in Holland is stated to be single-virus or glasshouse streak (*Lycopersicum* virus 1) [*R.A.M.*, xiv, p. 261], the properties of which closely resemble those of the ordinary tobacco mosaic virus (*Nicotiana* virus 1). The symptoms of the disease are very variable and include mosaic (liable to be accompanied in the spring at fairly high temperatures and relatively low light intensity by persistent fern leaf), mosaic plus foliar necrosis, mosaic plus foliar, stem and fruit necrosis, and necrosis alone. All the symptoms may be obtained by inoculation with the juice of plants showing any type of symptom, mosaic being apt, however, to predominate over necrosis. *Solanum nigrum*, a common glasshouse weed, is a host of single virus streak. Although the infective principle is introduced through the roots only with great difficulty under experimental conditions, much infection develops from the soil in nature, especially soon after planting, by contact of the young leaf and stems parts with the soil.

The inactivation of single-virus streak in the soil was found to be effected by oxidation. In soil maintained for seven months in an atmosphere of carbon dioxide the virus concentration remained unaltered. In pure river sand the inactivation process is complete in two months, in humus sand at least 5 per cent. of the virus is still in an active state after seven months, while in heavy clay a considerable period is likely to elapse before infectivity is lost. Total inactivation did not result from a spell of a fortnight's moderately severe frost (—5 to —10° C.). Fresh seed from diseased plants was found to give rise to a maximum of 1 per cent. infection.

Mixed-virus streak [loc. cit. *et passim*], caused by a combination of tobacco mosaic (*N.* virus 1) and potato virus X (*Solanum* virus 1), is also of fairly frequent occurrence, producing symptoms similar to those of single-virus streak in an intense form, but with more pronounced necrosis. In greenhouse experiments in the joint control of both disorders (single-virus streak predominating) the beneficial effects of hygienic precautions were to some extent neutralized by soil infection; this was prevented, however, by the application to the greenhouse soil of a thin layer of river sand and by avoiding splashing soil on the plants during watering. Other methods of soil disinfection include formalde-

hyde treatment and steaming (ten minutes at 90° or one hour at 80°), the latter resulting in 99 per cent. virus inactivation. Liberal applications of potash also tended to reduce the severity of the symptoms, which were often limited to the mosaic type only. Attention should also be paid to the use of healthy seed, nursery bed disinfection, general sanitation, and eradication of *S. nigrum*.

Blood (H. L.). **A method of measuring the relative resistance of varieties of Tomato and Bean to curly top.**—*Proc. Utah Acad. Sci.*, xv (*1937–8*), pp. 21–24, [? 1938. Abs. in *Exp. Sta. Rec.*, lxxx, 3, p. 352, 1939.]

In five years' tests, the following method of determining the relative resistance of tomato and bean to curly top [*R.A.M.*, xviii, p. 77] has proved to be fairly reliable. The seeds are drilled as soon as the danger of frost is over, and at the primary leaf stage, viruliferous insects (*Eutettix tenellus*) are placed on plants of each selection. Additional plants are inoculated each week for 3 or 4 weeks and then bi-weekly, until 8 inoculations have been made. For comparative weekly readings the cycle of disease development is divided into stages 1 (healthy) to 5 (complete death). From the data so obtained the weekly progress of the disease and the total response in the different selections are obtained. A coefficient indicates the relative resistance of the various selections.

Katser (Annie). **Ein Beitrag zur Anwendung des Antagonismus als biologische Bekämpfungsmethode unter besonderer Berücksichtigung der Gattungen Trichoderma and Phytophthora.** [A contribution to the application of antagonism between fungi in biological control with special reference to the genera *Phytophthora* and *Trichoderma*.]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 2, pp. 195–217, 1938; 3, pp. 221–330, 4 pl., 18 figs., 1938 (issued 1939). [Italian summary.]

In a study on mutual antagonism between *Trichoderma* and *Phytophthora* preliminary tests indicated that the former behaves parasitically towards the latter [cf. *R.A.M.*, xvi, p. 558 *et passim*]. When inoculations of *P. citrophthora* were made on filtrates of a culture of *T. koningi* on carrot broth no growth occurred within a month, though sparse growth took place on the filtrate of a culture of *T. koningi* grown and maintained in darkness. In further experiments complete growth failure did not recur and it is, therefore, assumed that after repeated transfers on artificial media *T. koningi* lost some of its antagonism. The growth of *P. citrophthora* was, however, sparse. While the filtrates from three-day-old cultures of *Trichoderma* permitted good growth of *P. citrophthora*, those from cultures of increasing age caused progressively greater inhibition of growth, inhibition being almost complete when the filtrate was from cultures over 14 days old.

By heating the filtrates of *T. koningi* to between 60° and 120° C., their toxic action was reduced. Filtrates of *T. lignorum* had a less marked inhibiting effect on the growth of *P. citrophthora* than filtrates of *T. koningi*. Those of the latter were less toxic to *P. parasitica* than to *P. citrophthora*.

Inoculations of *T. koningi* into its own filtrates indicated that the fungus produces autotoxins. The filtrates of *P. parasitica* and *P. citrophthora* retarded vegetative development and conidial production in *T. koningi*.

In greenhouse pot tests tomato collar rot due to *P. parasitica* [ibid., xvi, p. 132 and next abstract] was much reduced following soil inoculation with *T. koningi* before sowing. *T. koningi* inoculated alone into the soil in similar tests increased the germination of tomato seed and improved seedling growth, though inoculation after sowing had no effect. In combined inoculations with *T. koningi* and *P. parasitica* on tomato and apple plants and fruits the activity of the latter fungus was unaffected by the former.

KATSER (ANNIE). **Weitere Studien zur Anwendung des Antagonismus als praktische Bekämpfungsmethode des Keimlingssterbens der Tomaten.** [Further researches on the practical application of antagonism as a means of controlling damping-off of Tomato seedlings.]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 3, pp. 367–382, 4 pl., 2 figs., 1 diag., 1938 (issued 1939). [Italian summary.]

In experiments made to ascertain whether the antagonism shown by *Trichoderma koningi* towards *Phytophthora parasitica* [see preceding abstract] could be turned to practical account in the control of tomato seedling damping-off rot caused by the latter fungus, tomato plants were grown in hot-beds inoculated with *P. parasitica* alone, *T. koningi* alone, with *T. koningi* and then with *P. parasitica*, and untreated. In the first series of experiments the total numbers of seedlings per bed were 207, 722, 557, and 807, respectively, and in the second series the corresponding numbers were 98, 647, 287, and 837. In another experiment the results were inconclusive.

WOLF (F. T.) & WOLF (F. A.). **A study of Botryosphaeria ribis on Willow.**—*Mycologia*, xxxi, 2, pp. 217–227, 4 figs., 1939.

Willow canker caused by *Botryosphaeria ribis* [*R.A.M.*, xviii, p. 193] is stated to be widely prevalent on species of *Salix* throughout the south-eastern United States. The first symptoms of the disease are occasional blighted twigs and branches bearing elongate, depressed lesions which girdle the branches below the dying parts. Later on numerous circular, crateriform cankers, $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter, develop on the trunk and larger branches, as many as 100 occurring on one foot-length of trunk; by anastomosis they may give rise to larger cankers several inches in length. The bark in the cankered areas becomes dry and cracked and in spring and early summer an exudate attractive to ants accumulates on the surface of the lesion or flows from it. Within a year or two the cankers may completely girdle the trunk and the entire tree may be killed in three or four years. Dark stromata are visible protruding from cracks in the willow bark and the characteristic contents of fructifications of *B. ribis*, with one to six locules in each stroma, are revealed by cutting away the bark parallel to the surface. Only pycnidia of the *Dothiorella* stage occur on current season's willow twigs, but perithecia are found on older branches. Spermogonia develop in the autumn and winter on pycnidial stromata, producing hyaline, oval to

elongate microconidia, 2 to 3 by 1 μ. Both conidia and ascospores of *B. ribis* germinated readily on malt agar, germ tubes several times the length of the spore being formed within 3 to 4 hours. Pycnidial stromata of the *Dothiorella* type were produced in cultures derived from either conidia or ascospores. Zonation occurred in cultures kept under conditions of alternate light and darkness, but not in those kept in total darkness. Sectoring took place in a few cultures under both conditions. The development of the conidia, asci, and ascospores of *B. ribis* was studied cytologically and is described. The cells of the conidiophore are uninucleate, the conidia multinucleate, the ascospores uninucleate at first but become multinucleate later, and the hyphal cells multinucleate for a period following germination.

CAMPBELL (W. A.) & DAVIDSON (W.). **Poria andersonii and Polyporus glomeratus, two distinct heart-rotting fungi.**—*Mycologia*, xxxi, 2, pp. 161–168, 2 figs., 1939.

As a result of a study carried out in Washington, United States, the authors recognize the wood-rotting species *Poria andersonii* [*R.A.M.*, xvi, p. 505] and *Polyporus glomeratus* [loc. cit.], hitherto not clearly separated by mycologists and pathologists, as two distinct fungi on the basis of differences exhibited in nature and in culture. *Poria andersonii*, commonly isolated from trunk decay of living oak trees throughout the middle-western States but also reported on willow, poplar, and hickory, is stated to enter through branch stubs, fire scars, and other injuries and to cause a white decay similar to that caused by *Fomes everhartii* [ibid., x, p. 350]; it apparently always develops under the bark and has no pileus. Its setal hyphae are much smaller than those of *Polyporus glomeratus* and their distribution in the sporophores is more erratic and usually difficult to demonstrate. *P. glomeratus* causes a white to light brown spongy heart rot of maples, occurs also on beech, and is common on sugar maple in some areas in the Lake States; it develops on the outside of the bark, usually with some indication of a pileus, and has large setal hyphae easily detected in the sporophores. On malt agar *Poria andersonii* forms a mat typically yellow at all ages, and usually woolly or felty in texture. It has an optimum temperature of about 35° C., and grows twice or three times as fast as *Polyporus glomeratus*, which forms a white mycelium about the inoculum (which becomes compacted and olive-buff later on), an optimum temperature of 25°, and produces usually larger and more opaque setal hyphae, 7 to 16 μ in diameter. *Poria andersonii* produces short, bulbous setae on the mat surface, especially in staled areas, the setal hyphae ranging from 5 to 8 μ in diameter.

ESCHERICH (K. L.). **Der Eichenkropf und seine Ursachen.** [Oak 'goitre' and its causes.]—*Forstwiss. Zbl.*, lxi, 3, pp. 75–81, 8 figs., 1939.

Oak canker or 'goitre' in Germany [*R.A.M.*, xvi, p. 353] has been variously attributed to fungi (*Stereum rugosum* [ibid., xiii, p. 810] and *Nectria ditissima* [ibid., xiv, pp. 338, 407; xvii, p. 269]), insects, bacteria, and traumatic agencies, but recent studies at Sopron, Hungary, by A. Kelle (*IX. Kongr. int. Verb. forstl. ForschAnst., 1936*) are stated to have proved beyond a doubt that the excrescences are produced by the aphid *Lachnus roboris* as a sequel to incorrect silvicultural methods.

Siemaszko (W.). **Zespoły grzybów towarzyszących kornikom polskim.** [Fungi associated with bark beetles in Poland.]—*Planta polon.*, vii, 3, 54 pp., 5 pl., 3 figs., 1939. [English summary.]

The author studied the association of fungi with bark beetles on material collected from 1933 to 1937 in different parts of Poland. Constant associates of *Ips typographus* on spruce (*Picea excelsa*) [*P. abies*] were Saccharomycetaceae, mostly of a type closely resembling *Endomyces bisporus*, and the blue-staining fungi *Ophiostoma penicillatum* n.comb. [*Ceratostomella penicillata*], *O. polonicum* n.sp., and *Graphium pycnocephalum*; of *I. sexdentatus* on pine (*Pinus sylvestris*), Saccharomycetaceae and the blue-staining fungi *O.* [or *C.*] *ips* and *O.* [or *C.*] *pini*; of *Myelophilus piniperda* on pine, *O. pini*; and of *Scolytus scolytus* and *S. multistriatus* on elm (*Ulmus foliacea*), Saccharomycetaceae and the blue-staining fungus *G.* [*C.*] *ulmi*. Descriptions are given of these fungi and many others occasionally associated with the beetles.

The blue-staining *O. minutum* n.sp., an occasional associate of *I. typographus*, has superficial, brown, slightly hairy or smooth, subglobose perithecia 84 to 140 μ in height and 74 to 125 μ in diameter, with a rostrum 98 to 140 by 14 to 20 μ; the ascospores are hyaline, filiform-acicular, curved, 8 to 10 (12·5) by 1 to 1·5 μ. *O. penicillatum* has the conidial stage *Leptographium penicillatum*. *O. polonicum* n.sp. has conidial stages of both *Leptographium* and *Cephalosporium* types. The intensely brown-staining *Stysanus ulmi* n.sp. is an occasional associate of *Scolytus scolytus* and *S. multistriatus* on elms; it has synnemata 234 to 312 μ in height by 15·6 to 23·4 μ in diameter or 130 to 195 by 26 to 34·4 μ; conidia hyaline (fuliginous in mass), truncate at both ends, one more obtuse than the other, 3·8 to 5 by 1·9 to 2 μ. Latin diagnoses are given of the new species.

The author does not recognize the genus *Grosmannia* established by Goidànich [*R.A.M.*, xv, p. 826], which was made to include certain species of *Ophiostoma* on the grounds that these species differed from other representatives of the genus in having a conidial stage of the *Leptographium* type. However, as *O. ips* is known to have a *Graphium* conidial stage as well as one of the above-mentioned type, and the imperfect stages of *Mycosphaerella* are variable, it is considered possible for the genus *Ophiostoma* to have conidial stages of the types *Chalara*, *Leptographium*, *Graphium*, *Cladosporium*, *Cephalosporium*, and *Thielaviopsis*.

The most harmful wood-staining fungi in Poland are *O. pini* on pine and *O. piliferum* [or *C. pilifera*] and *O.* [or *C.*] *coerulescens* on pine and spruce; *O.* [or *C.*] *piceae* (conidial stage *G. penicillioides*) occurs on spruce, pine, oak, and fir; *L. serpens* n.comb. (syn. *Scopularia serpens*) has been found on the wood of a pine killed by the bark beetle *M. piniperda*.

Doudina (Mme V. S.). **Голландская болезнь ильмовых пород (Graphium ulmi Schw.)** [The Dutch disease of Elms (*Graphium ulmi* Schw.)].—47 pp., 23 figs., Госуд. Издат. колх.-совх. Литер. „Сельхозгиз" [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Moscow, 1938.

An account is given of the symptoms, world distribution, and control

of the Dutch disease of elms, the cultural characteristics of its agent *Graphium* [*Ceratostomella*] *ulmi* [*R.A.M.*, xviii, p. 282], and the relative resistance to the disease of various species of *Ulmus*.

In U.S.S.R. the disease was first investigated in 1936 and so far has been found in the Ukraine, in Moldavia, and in the Krasnodar and Saratoff districts. In Saratoff 3,500 trees were felled as a result of a severe attack in 1937. Pure cultures of *C. ulmi* were isolated from diseased samples from several districts. It is pointed out that *U. pumila* and *U. pinnato-ramosa*, recorded as resistant by workers in other countries, are widely distributed in Russian Central Asia and could serve as substitutes for the susceptible varieties.

SEELER (E. V.). **Thyronectria denigrata (Winter) Seaver, the cause of disease in Gleditsia.**—*J. Arnold Arbor.*, xx, 1, pp. 114–115, 1939.

The author states that isolations from diseased tissues and inoculation experiments proved that the sudden wilting, followed by death, of three *Gleditsia* [*Gleditschia*] *japonica* trees in the Arnold Arboretum, was caused by *Thyronectria* (*Pleonectria*) *denigrata*, a fungus which had been considered hitherto as only a saprophyte. Further investigation indicated that cankers which developed on many *G. triacanthos* trees on Nantucket Island, following severe winters, were also caused by *T. denigrata*.

HIRANE (S.). **Studies on the parasitism of the rust of Acacia confusa Merrill, Maravalia hyalospora (Saw.) Diet. II. Effects of the juice of phyllodes on the germination and germ-tube development of uredio-spores.**—*Trans. nat. Hist. Soc. Formosa*, xxviii, pp. 421–430, 1938; xxix, pp. 13–21, 2 figs., 1939.

Pursuing his studies on the parasitism of *Maravalia hyalospora* on *Acacia confusa* [*R.A.M.*, xvi, p. 717], the writer found that the uredospores of the rust germinate neither in distilled nor in tap water, but solely in an infusion or in the expressed juice of young phyllodes at dilutions of 1 in 1,000 (occasionally 1 in 10,000) and 1 in 10,000 to 1 in 100,000, respectively. The substance responsible for the germination of the uredospores was detected in the water placed on young, growing phyllodes, but in no case on mature ones, so that its occurrence would appear to be correlated with a state of active development. The expressed juice further contains a substance exerting an inhibitory effect on uredospore germination, particularly at high concentrations. The repressive effect was most pronounced in the juice of mature phyllodes, which are immune from the disease in nature, but was also apparent in that of the immune or highly resistant uppermost phyllodes and (to a very limited degree) in the juice of the susceptible young ones. Uredospore germination was likewise inhibited by a substance excreted from glands situated on the lower edge of the phyllode. The reaction of the phyllodes to *M. hyalospora* in nature is considered from these observations to depend largely on the influence of the substance inducing uredospore germination.

DE MESA (A.). **Camagon and its pests.**—*Philipp. J. For.*, i. 4, pp. 371–381, 3 pl., 1938. [Received March, 1939.]

Camagon (*Diospyros discolor*), which is stated to be one of the most

valuable Philippine woods for furniture-making and similar purposes, has been found liable to seed infection by *Schizophyllum commune* [*R.A.M.*, xviii, p. 360], invasion of the young trees through broken branch stubs by a species of *Irpex*, and root and bud rots of mature and over-mature trees by *Ganoderma applanatum*. *S. commune*, which completely suppressed germination, may be combated by light sprinkling of the seeds with formalin (37 to 40 per cent.) diluted to half-strength, the seeds being left covered for at least four hours following treatment. Trees severely infected by *G. applanatum* should be felled and the sound wood used immediately.

Důležitější a pozoruhodnější poškození, choroby a škůdci lesních dřevin v r. 1937–1938 v Československu, včetně území soused. státům odstoupených. [The most important and noteworthy injuries, diseases, and pests of forest trees in 1937–1938 in Czechoslovakia, including the districts ceded to neighbouring States.]—*Ochr. Rost.*, xv, 2, pp. 26–33, 1939. [German summary.]

In this list of diseases of forest trees the following are of interest: *Thelephora laciniata* [*R.A.M.*, xvii, p. 567] on *Picea excelsa* [*P. abies*] in nurseries; *Hypodermella sulcigena* [ibid., xvii, p. 570] and *T. laciniata* on *Pinus sylvestris*; *Cenangium abietis* on *Pinus austriaca* [ibid., xiv, p. 476]; *H. sulcigena* on *Pinus montana*; *Pucciniastrum epilobii* [ibid., xvii, p. 571] on *Abies alba*; *Phomopsis pseudotsugae* and *Rhabdocline pseudotsugae* [see next abstract] on *Pseudotsuga douglasii* [*P. taxifolia*]; and *Bacterium* [*Pseudomonas*] *savastanoi* on ash [ibid., xvi, p. 216].

Kalandra (A.). **První výskyt sypavky Douglasky—působené houbou Rhabdocline pseudotsugae Syd.—v odstoupeném Sudetském Území Čech.** [First occurrence of needle-fall of Douglas Fir—caused by the fungus *Rhabdocline pseudotsugae* Syd.—in ceded Sudetenland.] —*Ochr. Rost.*, xv, 2, pp. 36–40, 7 figs., 1939. [German summary.]

The needle-fall of Douglas fir, caused by *Rhabdocline pseudotsugae* [*R.A.M.*, xviii, p. 3], was observed in the spring of 1938 for the first time in Czechoslovakia on three fairly small stands of 30- to 40-year-old trees near Marienbad. The severity of the infection varied with individual trees, some of the crowns being rather badly defoliated. None of the trees has so far been killed.

Thomas (E. A.). **Über die Schweizer Douglasienschütte.** [On the Swiss needle-fall of Douglas Firs.]—*Schweiz. Z. Forstw.*, xl, 2, pp. 55–62, 1 fig., 1939.

Most of the literature on the Swiss needle-fall [*Phaeocryptopus gaeumanni*] of Douglas firs [*Pseudotsuga taxifolia*: *R.A.M.*, xviii, p. 425] here briefly summarized and discussed has already been noticed from time to time in this *Review*. Mention may be made, however, of an oral statement by H. Bürger to the effect that old trees (51 and 55 years) in two cantons of Switzerland have been observed to suffer from the disease, hitherto believed to be restricted to the under 40 age group, in a virulent form.

Ludbrook (W. V.). **Needle fusion of Pinus in southern New South Wales. Second progress report (1937–38).**—*Pamphl. Coun. sci. industr. Res. Aust.* 89, 20 pp., 1939.

In further work on needle fusion in *Pinus* spp. in New South Wales [*R.A.M.*, xvii, p. 149; xviii, p. 283] the author failed to transmit the disease by grafting. The diseased scions grafted on healthy stocks either died or produced healthy new growth during the first or second season after grafting, and healthy scions on diseased stocks remained healthy during two seasons' growth. The continuous eradication of diseased trees from plots of five species of *Pinus* during four successive seasons had no real effect on the incidence of the disease in the remaining trees. In plots of *P. muricata*, *P. ponderosa*, *P. radiata*, and, when growing under favourable conditions, of *P. caribaea*, the percentage of diseased trees increased not at all or only slightly after a certain age, varying from three to eight years after planting out; in plots of *P. taeda*, which was more severely affected by the disease than any other species, the percentage of diseased trees increased up to at least ten years of age. Except in *P. muricata*, severely affected trees were much less numerous than those only slightly affected, the latter being often observed to recover. It is considered possible that the mild and the severe forms are two distinct diseases, needle fusion being a symptom common to both.

Heavy annual dressings of calcium superphosphate, either alone or in combination with nitrate of soda and sulphate of potash, led to complete or partial recovery of six out of 27 diseased *P. muricata* after one to three years, four of the six showing an increased vigour of growth. During the same period four out of 78 controls also showed signs of recovery. Treatment with borax or boric acid resulted after one to two years in complete or partial recovery of 14 out of 52 diseased *P. muricata* as compared with 27 out of 221 controls, but was not followed by increased vigour of growth. *P. ponderosa* and *P. radiata* did not respond to treatment with boron compounds. Spectrographic examinations of healthy and diseased needles revealed a marked deficiency of silver in diseased samples, but treatment with silver compounds gave negative results. Treatment with other chemicals, and also pruning, thinning, or top-dressing with farmyard manure failed to control the disease. Under present conditions the disease is not considered to be of economic importance in southern New South Wales to any of the *Pinus* spp. except *P. taeda* and possibly *P. caribaea* in coastal areas.

Faull (J. H.). **A review and extension of our knowledge of Calyptospora goeppertiana Kuehn.**—*J. Arnold Arbor.*, xx, 1, pp. 104–113, 1939.

In giving a brief review of the literature dealing with *Calyptospora goeppertiana* [*R.A.M.*, xii, p. 666], the author states that the fungus has been experimentally shown to be able to infect 13 species of *Abies*, no species of which is known to be immune from the fungus. Details are then given of life-history studies, in which *A. balsamea* was successfully infected with teleutospores from *Vaccinium pennsylvanicum* and *V. canadense*. A comparative study of *C. goeppertiana* [the results of which are tabulated] with *Peridermium ornamentale* and *P. holwayi*, which are held by Arthur [ibid., xiii, p. 728] to be synonymous with the

first-named, indicated that the last two are probably distinct from one another and that neither is identical with *C. goeppertiana*. Should further studies demonstrate the existence of diploid phases of *P. ornamentale* and *P. holwayi* referable to the genus *Calyptospora*, then the existing collections of *C. göeppertiana* from western North America should be subjected to revision. The paper terminates with a list of the specimens of *C. goeppertiana* which were studied by the author, showing that the rust is present in Germany and Japan as well as several parts of Canada and the United States. *V. vitis-idaea* var. *minus* is included as a new host.

WAGENER (W. W.). **The canker of Cupressus induced by Coryneum cardinale n.sp.**—*J. agric. Res.*, lviii, 1, pp. 1–46, 8 figs., 1 graph, 1 map, 1939.

This is a full report of the author's studies of the bark canker of *Cupressus macrocarpa* and *C. sempervirens stricta* in California, including a description [with a Latin diagnosis] of the causal fungus, named *Coryneum cardinale* [not *C. cardinalis*: *R.A.M.*, xviii, p. 149]. In California the canker is estimated to have killed up to date about 30,000 trees of the two species, and in many districts discourages their further cultivation; it has been found sporadically on *C. pygmaea*, *C. lusitanica*, *C. forbesii*, *Thuja orientalis*, *Libocedrus decurrens*, and *Juniperus*. The disease is also known to occur in the North Island of New Zealand. The most conspicuous symptom of the disease is the fading and death of individual twigs, branches, or tops of affected trees, most frequently in spring at about the time when the host begins normally to grow rapidly, though it may also occur throughout the year. Under favourable moisture conditions fruiting bodies of *C. cardinale* are produced on killed bark; they appear as small, scattered, black, subepidermal or partially immersed acervuli, at first closed, later erumpent and opening widely; they are irregularly circular, oblong, or lenticular in outline, and 0·3 to 1·5 mm. in diameter; the sporogenous margins are frequently persistent after opening and often reflexed. The stromatic layer is often loculate or semiloculate, up to 300 μ thick, subhyaline to light olivaceous. The conidia are oblong-fusoid, 5-septate, 21 to 26 (18 to 33·5 μ) by 8 to 10·5 μ (7·5 to 12 μ), the four median cells concolorous, olive-brown, 16·5 to 18·5 μ (14 to 20 μ), not or slightly constricted at the septa, end cells muticately short-conic to occasionally long-conic, hyaline. The conidiophores are simple or branched, 15 to 55 by 1·4 to 2·2 μ, and the pseudoparaphyses are filiform, somewhat sinuous, 40 to 60 by 1 to 1·5 μ. In nature spore production is governed chiefly by humidity, and field evidence and tests on material stored indoors indicated that the conidia are relatively long-lived. Field dissemination appears to occur chiefly through the agency of wind and rain, but the disease has also been spread on nursery stock and locally by means of pruning tools, and birds and insects are suspect. Localization of the disease appears to be the most promising method of control.

COLLEARY (M. J.). **The treatment of fence-posts with preservatives.**—*Circ. For. Serv. Can.* 56, 17 pp., 2 figs., 1939.

This is a comprehensive account of the treatment of fence posts with

preservatives by means of a brush, by dipping, steeping, and by the hot and cold open-tank method. Using creosote, the estimated increase in life by the brush, dipping, and hot and cold treatments is 2 to 3, 2 to 4, and 15 to 20 or more years, respectively. Zinc chloride and sodium fluoride applied by the hot and cold tank method both gave a life increase of 10 to 15 years. Treatment with creosote by the hot and cold tank method cost for materials from 10 to 40 cents per post and with zinc chloride 6 cents. Permissible expenditures for treatment are discussed but it is not practicable to give a general cost figure covering all operations.

GÄUMANN (E.). **Über die Wachstums- und Zerstörungsintensität von Polyporus vaporarius und von Schizophyllum commune bei verschiedenen Temperaturen.** [On the intensity of growth and destructive activity of *Polyporus vaporarius* and *Schizophyllum commune* at different temperatures.]—*Angew. Bot.*, xxi, 1, pp. 59–69, 3 graphs, 1939.

In cultural experiments with the wood-rotting fungi *Polyporus vaporarius* [*Poria vaporaria*: *R.A.M.*, xvii, p. 786] and *Schizophyllum commune* [see above, p. 490] the optimum temperatures for vegetative growth (as determined by measurements of the diameters of the colonies) were found to be 26·7° and 33·1° C., respectively, while the biological activity of the two fungi (calculated from the amounts of wood substance rotted or the loss in weight of the wood) was greatest at 24° and 30·1°, respectively, the optimum temperature being in both cases 2° to 3° lower than that for growth.

RAABE (A.). **Untersuchungen über pilzparasitäre Krankheiten von Raps und Rübsen.** [Investigations on parasitic fungal diseases of Colza and Rape.]—*Zbl. Bakt.*, Abt. 2, c, 1–3, pp. 35–52, 9 figs., 1939.

The writer has investigated the fungal pathogens of colza (*Brassica napus* var. *arvensis*) [*B. campestris* var. *oleifera*] and rape (*B. rapa* var. *silvestris*) [*B. napus* var. *oleifera*] in Germany [*R.A.M.*, xvii, p. 717] with a view to ascertaining their modes of infection and economic importance. *Alternaria brassicae* (Berk.) Bolle, to which rape is more susceptible than colza, was shown to be capable of attacking seedlings of both species under very humid conditions, but in practice the necessary degree of atmospheric moisture is seldom likely to prevail at this stage in the development of the crops. The fungus is not seed-borne, infection being perpetuated by conidia produced in the early summer on overwintered plant debris.

In inoculation experiments with various strains of *Rhizoctonia* (*Hypochnus*) [*Corticium*] *solani*, H. Schultz's var. *typica* [ibid., xvii, p. 184] from potato, which has been found in nature on colza roots [ibid., xi, p. 95], caused no damage beyond mechanical interference with normal activity; the same worker's var. *brassicae* was severely pathogenic to young plants both of colza and rape. Pending further studies on the relationship between the *C.* strains on potato and the oleaginous crucifers these crops should not be grown in rotational sequence.

No physiological differences could be detected between the hemp and

colza strains of *Sclerotinia sclerotiorum* [ibid., xvii, pp. 217, 717], and the mycelium and ascospores of a hemp strain readily infected colza. *Botrytis cinerea* may be a source of severe damage to colza under unfavourable environmental or cultural conditions, rotting the stem bases and covering them with a dense, grey coating. The general aspect of plants attacked by *S. sclerotiorum* or *B. cinerea* is very similar. No importance need be attached to the occasional development on colza of *Erysiphe communis* and *Peronospora brassicae* [*P. parasitica*]. A species of *Typhula*, with spherical or reniform sclerotia, 1 to 2 mm. in diameter, is prevalent in the spring on colza leaf remnants in an advanced stage of decay, and has also been observed in the writer's experimental plots on sickly young plants dying from collapse of the stems and heart shoots. Possibly the fungus may play a part in the complex of symptoms collectively known as 'winter injury'. *Phoma lingam*, which has recently assumed a serious form on cabbage in parts of Germany [ibid., xv, p. 335], has been reported from New Zealand on colza [ibid., xiii, p. 71], and experiments with this fungus have accordingly been initiated at the Biological Institute.

Leclerg (E. L.). **Studies on a cultural variant of Rhizoctonia solani.**—*Phytopathology*, xxix, 3, pp. 267–274, 3 figs., 1939.

Details are given of the writer's studies at the Louisiana Agricultural Experiment Station on the physiology, morphology, and pathogenicity of a sector variant of *Rhizoctonia* [*Corticium*] *solani* from sugar beet on various media [*R.A.M.*, xvii, p. 498]. The variant grew less rapidly than the parent culture on potato dextrose, dextrose, and methylene blue media, but much faster on substrata of high-, medium-, and low-nitrogen composition. On media containing varying amounts of sucrose, the parent grew more rapidly at 0, 1, and 5, and the variant at 10 and 20 per cent. sucrose. At 15°, 23° to 25°, and 29° to 30° C. the radial growth of the variant was less than that of the parent. The mutant was less aggressive than the parent in the decay of large sugar beet roots (average of 8·5 as against 33·2 per cent. volume of rot), but caused more damping-off at soil temperatures of 15° and 25° (100 per cent. at both compared with 73·4 and 69·4, respectively).

Вредители Сахарной Свеклы и меры борьбы с ними. [Diseases of the Sugar Beet and measures for their control.]—ex *Свекловодство* [*Sugar Beet Industry*], iii, pp. 203–392, 77 figs., 2 graphs, Гос. Издат. колхоз.-совхозн. Лит. УССР [State Publ. Off. Lit. coll. co-op. Fmg Ukr.S.S.R.], Kharkoff [? 1938: Received April, 1939].

This compilation is the work of V. P. Muravyeff, Mme N. I. Salunskaya, and S. F. Morotchkovski, under the general editorship of M. P. Panassyuk. The authors give a general account of the diseases of sugar beet throughout the world, with particular stress on those that occur in the U.S.S.R., incorporating the results of recent researches. Control measures, including breeding for resistance, are dealt with in detail. A dichotomous key for the identification of the diseases by their external symptoms is appended, together with a full list of the Latin names of the parasitic organisms concerned.

CROSIER (W.) & PATRICK (S.). **Chemical elimination of saprophytes during laboratory germination of seed Peas.**—*J. agric. Res.*, lviii, 6, pp. 397–422, 1939.

In tests with various seed disinfectants for inhibiting the growth of saprophytes on germinating pea seeds [cf. *R.A.M.*, xvii, p. 644], both seeds and seedlings were effectively protected from the seed-borne *Rhizopus nigricans*, *Penicillium* spp., and *Dematium* [*Pullularia*] *pullulans* by 0·18 per cent. new ceresan, 0·20 per cent. mercuric chloride, or 1·5 per cent. ceresan dip. Other mercury compounds were nearly as efficient, whereas copper and zinc compounds protected the seeds but not the seedlings. *Alternaria* spp., *Rhizoctonia* [*Corticium*] *solani*, and *Fusarium* spp. were not controlled by any seed treatment. The radicles of ceresan-treated peas were longer and the green weights of the sprouts greater than those of the untreated peas. A dust containing 80 per cent. copper stearate, 16 per cent. diluent, and 4 per cent. new ceresan completely disinfected 30 varieties of peas.

ARTEMIEVA (Mme Z. S.). Возбудители некоторых бактериозов фасоли. [The causal organisms of some bacterial diseases of French Beans]. —*Микробиол.* [*Microbiol.*], vii, 7, pp. 899–911, 1938. [Received April, 1939.]

Cultures of *Bacterium medicaginis* var. *phaseolicola* [*R.A.M.*, xviii, p. 366] and *Bact. puerariae* [regarded by Burgwitz as a synonym of the former: ibid., xv, p. 4] isolated in Moscow from seeds and from pods and leaves of French beans [*Phaseolus vulgaris*], respectively, were compared with each other and with a bacterium also isolated from seeds of the French bean, which seemed to occupy an intermediate position between the two species. It is believed that all three forms are closely related and are able under natural conditions to pass from one into the other by losing or acquiring certain biochemical properties. Thus, a strain isolated from a plant artificially infected with *Bact. puerariae*, was found to have lost the capacity to peptonize milk, typical for *Bact. puerariae*, while it was able to liquefy gelatine, a property characteristic of *Bact. medicaginis* var. *phaseolicola*. Antisera of *Bact. mori* [ibid., xvii, p. 799; xviii, p. 158] were able to agglutinize *Bact. medicaginis* var. *phaseolicola* and *Bact. puerariae* as well as *Bact. mori*, and vice versa. The acid-producing strains of *Bact. mori* are considered to be a link between the alkali-producing strains of *Bact. mori* and *Bact. medicaginis* var. *phaseolicola*. In cross-inoculation experiments *Bact. medicaginis* var. *phaseolicola* and *Bact. puerariae* were able to infect beans but not mulberry, while *Bact. mori* infected mulberry but not beans. Strains 216, 285, and 3040 of *Bact. medicaginis* var. *phaseolicola* received from Rostoff differed from the other strains of this bacterium in their serological and biochemical properties and produced no infection on either French beans or mulberry.

Bact. phaseoli var. *fuscans* [ibid., xvi, p. 85] was also isolated from French beans. It is considered to be rather unstable in its biochemical properties, showing great variation in its reactions to milk and gelatine. Some strains of this bacterium, designated β, which are generally non-pigmenting, produced pigment on media with tyrosine, and strains 100

and 102 did not pigment at first but began to produce pigment after a month.

DIPPENAAR (B. J.). **Diseases of Lettuce. I. Macrosporium leaf spot.**—*Fmg S. Afr.*, xiv, 156, pp. 101–103, 106, 3 figs., 1939.

A popular description is given of the leaf spot of lettuce in the Cape Flats district of South Africa caused by *Macrosporium sarcinula* [*Stemphylium botryosum*: *R.A.M.*, xviii, p. 141] (the perfect stage of which, *Pleospora herbarum* [ibid., x, p. 430], has not yet been observed in the field though it readily develops on standard media in the laboratory), supplemented by full directions for its control by repeated applications of standard sprays (verderame 5 lb., ortho spreader ½ lb., 100 gals. water, or Bordeaux mixture 4–6–100 plus ortho) or dusts (verderame, copper-lime 1 : 4, or folosan).

WATANABE (T.). **On the anatomy of Sweet Potatoes affected by the stem rot fungus.**—Reprinted from *J. agric. Res. Soc. Utsonomiya agric. Coll.*, *1939*, 14, 11 pp., 2 pl., 1939. [Japanese, with English summary.]

Observations on sweet potato plants of the Kawagoe-Beniaka variety infected by stem rot (*Fusarium*) [? *bulbigenum* var. *batatas* and *F. oxysporum* f. 2: cf. *R.A.M.*, xiii, p. 123; xvii, p. 658] showed that the fungus is capable of inducing a splitting and brown discoloration of the stem when introduced through deep longitudinal cuts. The phloem and cambium were most accessible to penetration, followed by the xylem, medullary rays, and pericycle, while the starch sheath and pith were also slightly involved. The superficial inoculation of uninjured stems gave negative results. Generally speaking, the symptoms of stem rot were relatively mild in artificially infected plants, which succumbed only under conditions exceptionally favourable to the fungus. In cases of natural infection invasion proceeded rapidly through the vessels and contiguous tissues, the mycelium being detected at distances of up to 80 cm. from the end of the fissure and vascular discoloration and tyloses even farther from the site of entry. The externally sound storage roots of diseased plants were found to show similar evidence of permeation by the fungus.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Norfolk) Order of 1939. Dated February 10, 1939. No. 164 of 1939.—4 pp., 1939.

This Order, effective as from 1st March, 1939, and concerned with the control of fungal diseases of fruit trees in Norfolk (exclusive of the Borough of King's Lynn or the County Borough of Great Yarmouth), is on similar lines to those previously issued to other local authorities [*R.A.M.*, xvi, p. 576].

Service and regulatory announcements. October–December, 1938.—*S.R.A.*, *B.E.P.Q.*, *U.S. Dep. Agric.*, 137, pp. 142–153, 1939.

Summaries are given of the plant quarantine import restrictions in force in Switzerland, Argentina (supplementary), Australia (supplementary), and the French Regency of Tunisia.